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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 58

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HARDWARE

UDC 62-52:681.3.06

SM-1800 MICROCOMPUTER TECHNICAL SPECIFICATIONS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 (manuscript received 17 Jul 80) pp 118-124

[Excerpt from paper by A.A. Ursat'yev and A.A. Morozov: "Design Principles for Automated Control and Monitor Subsystems for Resistance Welding in Integrated Automated Control Systems"]

[Excerpt] From these viewpoints, the most suitable technical tool for the central digital processor of local ASUTP's [automated systems for technological process control] could be the microcomputers of the second stage of the SM EVM [international system of small computers], for example, the SM-1800 microcomputer. The SM-1800 is a modularized microcomputer which can be built into equipment and is designed around LSI circuits, fabricated using n-channel MOS technology. Its major components are: a central eight bit processor module with an instruction execution time of 2 to 8.5 microseconds, including a main memory and an ROM with capacities of 1 K and 2 K bytes respectively; a main memory module with a capacity of 16 K bytes and an ROM module with a capacity of 4 K bytes for a word length of eight bits; an analog input module with 16 channels, including an analog-digital converter with a conversion time of no more than 60 msec and an input signal level of ± 5 volts; an analog output module with four output channels and a digital input-output module (16 or 32, and 16 channels respectively). The software for the SM-1800 is intended for debugging and running programs automatically on the SM-1800 and in a cross mode on the M4030 computer as well as on machines of the unified system computer series. The programming tools make it possible to automatically program in assembler languages as well as in languages of a different level.

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CSO: 1863/225

PS-300 CONTROL COMPUTER COMPLEXES

Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 81 p 23

[Item: "PS-300 Control Computer Complexes"]

[Text] The process control computer plant of the Tbilisi "Elva" NPO [Scientific Production Association] has mastered the series production of PS-300 UVK [process control computer complex] process control computer complexes, created on the basis of PS-300 microcomputers (employing homogeneous changeable structures) and without analogues.

The PS-300 UVK is intended for use in ASU's [automated control systems] for local technological processes, in data processing and measuring systems, for direct digital control, and also in complicated hierarchically structured control systems at the lower hierarchical level.

The structure of the PS-300 UVK includes the following: a PS-300 computer, process interface units (USO's) and data display equipment.

The USO's consist of the following equipment: an analog signal input unit (UVA), a digital signal input unit (UVD) and an output unit (UV).

The information display equipment includes a process engineer operator's console with a deviation signaling display and digital devices.

Key Technical Data

PS-300 computer: equivalent execution rate--50,000 operations/s; capacity of RAM--20 Kbytes; number of peripherals which can be connected--12.

UVA: maximum number of analog signals which can be hooked into a single unit--32; unified current signal--0 to 5 mA.

UVD: maximum number of digital signals which can be hooked into a single unit--128.

UV: maximum number of analog-action channels per single unit--16; unified current signal--0 to 5 mA; maximum number of on-off-action channels--128.

The exchange of information by the PS-300 computer with other PS-300 UVK units is accomplished according to the algorithm of a 2K interface.

Orders are to be sent to the following address: 380086, Tbilisi, ul. Dzhikiya, 10, NPO "Elva."

8831
CSO: 1863/230

ARM-R/NAIRI-4, ARM-M/NAIRI-4 AUTOMATED WORK PLACES

Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 81 p 23

[Item: "The Yerevan 'Elektron' Plant Offers the ARM-R/Nairi-4 and ARM-M/Nairi-4 Automated Work Places"]

[Text] The ARM/Nairi-4 automated work places developed on the basis of the Nairi-4/ARM computer are software compatible with ARM [automated work place] assemblies based on the M-400 and SM-3 and are designed for automating work in the development of radio electronic equipment (ARM-R/Nairi-4) and machine building products (ARM-M/Nairi-4), as well as for the implementation of a dialog mode in the process of developing products for different purposes in automated design systems (SAPR's).

In the independent mode the ARM/Nairi-4 makes it possible to solve problems relating to the input/output of graphic information and to the performance of small-volume calculation work, for example: the arrangement of elements of random configuration on the area of a printed circuit board, division and editing of the topology of printed circuit boards, the execution of electrical circuit diagrams and the preparation of assignments for the modeling of analog and digital circuits, the mechanized fabrication of control perforated tapes for producing photomasters of printed circuit board words, as well as control perforated tapes for automata with program control, the output of documentation (both graphic and text) for transfer to production, the correction and editing of graphic, text and mixed documents, the execution of assembly diagrams for printed circuit boards, assemblies and cabinets, the writing of programs for often repeated calculations by means of a programming language oriented toward an engineer (FOKAL, graphic FOKAL and BASIC), the preparation of information (formalized assignments) for subsequent transfer to the central computer of an SAP [automated programming system] for the purpose of implementing functional and technical design tasks, the representation on the screens of displays of the output onto paper of results obtained with the SAP central computer, and the entry of standard design elements into the ARM library.

Technical Data

Word length--16 bits; working storage: capacity--64 Kbytes, access time--0.6 µs; cycle time--1.1 µs; duration of machine cycle--240 ns; time for execution of key operations: of register-register type--3.7 µs, register-storage--5.4 µs, storage-storage--8.9 µs, transfers--2.7 µs; general-purpose programmable registers--20;

number of simultaneously run independent routines--4; main channel: maximum rate of data transmission--2 Mbytes/s, data transmission mode--monopole multiplex, data transmission formats--1 or 2 bytes, maximum line length--100 m; number of peripherals which can be connected by means of the main channel--up to 20.

Power requirements: 380/220 VAC +10 percent, -15 percent, frequency of 50 ± 1 Hz.

Delivery stipulations--through direct contract channels.

Address of manufacturing plant: 375086, Yerevan, "Elektron" Plant.

8831
CSO: 1863/230

'AEROFLOT' AUTOMATED SYSTEM TO BE DEMONSTRATED

Moscow VOZDUSHNYY TRANSPORT in Russian 18 Aug 81 p 2

[Article by V. Mikhnevich, supernumerary correspondent: "The Electronic Computer Never Sleeps"]

[Text] Once the only "computer" on board and aircraft was the pilot's brain. Today the electronic "brain" is there to help. The use of the electronic computer solves in a new way one of the key problems of present high-speed aviation--the problem of control. Automated control of air traffic is now on the agenda.

The exercise of control on an essentially different basis required a radical improvement of the most important link in the chain of control--communication. Much depends on the quality of work of communication in aviation. To this day, the radio chan continues to be the only thread connecting an airliner's crew tith the ground. In recent years, specialists' efforts have been directed to the creation of communication systems capable of effectively operating under conditions of automated complexes. Today this problem is practically solved. Displays of the Soviet section of the Moscow International Specialized "Communication-81" Exhibit, opening in September of this year, will demonstrate the multipurpose "Aeroflot" automated system, developed in our country for civil aviation.

"This system," engineer Boris Semenovich Kuz'min states, "is meant to contribute to the solution of the chief problem facing pilots: to increase the throughput capacity of airports and air routes with guaranteed safety under conditions of high density of freight-passenger transportation. A characteristic feature of this equipment is that it makes it possible to maintain high-speed exchange of information between the crews of airships and land services automatically. The use of progressive methods of numerical coding in combination with microprocessors built into the radio equipment makes it possible to use on board a communications channel for automated transmission of data from various sources. Furthermore, it is possible to include, in addition to vocal information telemetry in it without any special difficulty. This affords relief to the pilot and then makes it possible to provide the ground air traffic control service with information obtained directly on board the aircraft with the help of available technical equipment. Thus, data on the location of the aircraft, speed and height of flight, supply of fuel in the fuel tanks, the weather situation on the route at that point where the aircraft is located and on the operation of the airborne equipment are transmitted. The exchange will be conducted in computer language. This is a first step toward a dialog between computers--a cherished dream of cyberneticists.

How will the obtained information be used on the ground?

We are quite accustomed to complaints about the weather service in connection with prediction of the weather. But is this always fair? In the final analysis, the possibilities of meteorologists are limited. Now it becomes possible to provide them with significant help. Data on the weather transmitted directly from hundreds of aircraft located in the air at the same time will not only provide with a high degree of accuracy the weather situation on routes but also predict its development with the aid of the computer.

We know how fatiguing it is for the pilot to constantly have to listen over the air and to catch from this dissonance of reports those addressed directly to the crew. Now this process is to be simplified. Each aircraft will be given its own code, and the processor on board will tune in on the communication signal only after it has analyzed the information and made certain that the latter has reached the proper address.

The example, finally, is at first glance paradoxical. Why should, after all, data be transmitted to the ground on the operation of airborne systems? Each aircraft has on board recorders, which register with great accuracy the operation of the equipment on board. The equipment itself is so constituted that in case of failure the reserve instantly goes into operation. But, looking into this, one finds reason for this. On landing the inoperative unit is obligatorily replaced, but this is an operation that requires time. Outlays can be significantly reduced if the proper services are alerted in advance while the plane is still in the air.

Nor will the passengers be forgotten. It will be possible from on board the aircraft to reserve by radio a room at a hotel, to send a telegram or to order a taxi.

"Aeroflot," in addition to equipment on board, will include automated land transmitting and receiving radio centers using remote control for operation from a single communications center. They will provide a reliable supply of information at one time to 40 airliners in the zone of the airport and to 300 on the route.

Such will be civil aviation's tomorrow.

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CSO: 1829/331

BRIEFS

FOURTH-GENERATION COMPUTERS--Scientists of the Ukrainian SSR Academy of Sciences Institute of Cybernetics have developed a project for a recursive computer which can operate dozens and hundreds of times faster than contemporary computers. The innovation has already been embodied in a real unit. "The fourth generation of computers is based on fundamentally new scientific and engineering solutions," reports USSR State Prize Winner Doctor of Physical and Mathematical Sciences Yu.V. Kapitonova. "Their predecessors usually consist of one or two processors--units which receive instructions and process data. A recursive computer is a multiprocessor computer: It unites up to 250 of such units. The speed of solving a problem presented is increased as a function of their number and efficiency. If, for example, a computer of today performs one million operations per second, a new computer having 100 processors is 100 times faster. You cannot manage without one in calculating designs of aircraft, energy systems and nuclear reactors, on which months and years are spent now." [By T. Larina, Kiev] [Text] [Kiev RABOCHAYA GAZETA in Russian 28 Jul 81 p 2] 8831

BAKU'S NEW COMPUTING CENTER--The modern building of the new collective-use computing center has adorned Leninskiy Rayon in the capital of Azerbaydzhan. Its construction was carried out over a period of three years by the combined crew of Sh. Kerimov from general contracting construction administration SU-49 of the Ministry of Industrial Construction, finishers of Hero of Socialist Labor G. Rasulov from SU-76 of the Ministry of Industrial Construction, and the team of installers headed by Z. Khasiyev from SSMU-1 [Special Construction and Installation Administration No 1] of the Spetspromstroymontazh Trust. The work commission signed the document for acceptance of the building. The contractors completed the construction and installation work, to the tune of 170,000 rubles, seven months faster than planned. This was able to be achieved on account of the good organization of work in all sections and the precise interaction of subdivisions taking part in the construction. Work is now being completed on the organization of public services for the territory. The builders are obligated to surrender the site completely by 15 August. [By Kh. Islamova, senior engineer, Ministry of Industrial Construction SU-49 Production Division] [Text] [Baku VYSHKA in Russian 12 Aug 81 p 3] 8831

'ELEKTRONIKA BZ-37' MICROCALCULATOR--From simple arithmetic operations to complex engineering calculations--that is the range of its job. It can perform the four arithmetic operations, compute natural and common logarithms and antilogarithms and trigonometric and inverse trigonometric functions, extract the root, raise to a power, and perform operations with memory and with a constant. Power supply is universal--by batteries or an a.c. line. Price--90 rubles. This microcalculator

can be purchased in Kult'torg [Organization for Trade in Goods for Cultural Purposes] and Potrebkooperatsiya [Consumer Cooperative] stores. The "Elektronika BZ-37" facilitates the work of both the student and scientist. [By Telepresstorgreklama] [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 81 p 23]
8831

CSO: 1863/232

UDC 681.31

PROBLEM SOLVING PROCESS INTERPRETER FOR MINICOMPUTERS USING UNIFIED SERIES OF ELECTRONIC COMPUTERS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 (manuscript received 2 Jul 80, after revision 20 Feb 81) pp 62-67

[Paper by G.A. Maksimey]

[Text] Recent years have been characterized by an expanded sphere of minicomputer applications, something which requires the supplementation of software with a number of special functions. In this case, the development of software and control routines for various technological processes for minicomputers using the minicomputer directly is frequently made difficult because of the following factors:

--The minicomputer can be in service around the clock in the control system, and for this reason, there is no remaining time to debug supplemental software;

--The resources of specific minicomputers can be limited and it is assumed that they will be expanded in the future;

--The development of software runs ahead of the delivery of the minicomputer itself.

For this reason, various cross systems, compilers, modeling systems and minicomputer interpreters are widely used for this developmental work [1-5], where these are realized on all-purpose computers (serving as tools), which have a complete set of the requisite hardware and resources. The modeling of the input-output instructions represent the greatest difficulty in the realization of such interpreters. This is due to the fact that, as a rule, there are serious differences in the organization of the input-output for minicomputers and the computer serving as a tool in this regard.

A technique for the construction of an interpreter for the M7000, SM-1 and SM-2 minicomputers, in which the functions of the operating system for the organization of the input-output are modeled, is treated in this paper. A disk operating system is considered as the operating system of the computer being modeled.

The interpreting is accomplished in the disk operating system of the unified computer system and the interpreter which is developed can be used in any computer of the unified system series and the M4030. The interpreter can perform the following functions: generation and starting of the DOS [disk operating system] of the minicomputer, translation, arranging and debugging programs written in the minicomputer input languages as well as the execution of any directives of the minicomputer DOS without any limitations. Two interpreting aspects are differentiated: the simulation of minicomputer equipment functioning on the tool computer and the modeling of the interaction of the software (MO) components of the minicomputer.

The Simulation of Minicomputer Equipment Functioning. The operation of the following equipment components is simulated: the main memory (OZU), the main registers, the external memory and the peripherals. A data file P with a length of 32 K half-words is set aside in the tool computer for the interpretation of the main memory. The peripheral memory of the minicomputer on magnetic disks (MD's) is simulated in the tool computer by a direct access file on YeS5052 magnetic disks.

The A and B registers, as well as the RI1 and RI2 index registers, which in the minicomputer correspond to the first main memory locations, occupy the first four half-words of the P data file respectively. In the tool computer, the expansion and overflow registers of the minicomputer are modelled by memory bytes, and the keyboard register is modeled by a memory half-word. The operation of the RB1 and RB2 base registers is not modeled, since the interpreter is designed for a memory of 32 K words, as well as upper and lower limit registers, since only the single section operational mode of the minicomputer is interpreted. A common tool computer register is used to model the instruction number register (RNK). The peripherals are modeled by the appropriate hardware of the tool computer and the input-output facilities of the unified computer series are used to control them.

The Interpreting of Minicomputer Software Functioning. We shall analyze separately how the minicomputer DOS is interpreted and the DOS generation and start programs of the minicomputer are modeled. With the exception of the input-output control routine, all of the program components of the minicomputer DOS are realized by means of instruction by instruction interpretation. For this purpose, all of the DOS program modules of the minicomputer, during the process of generating it, are written on the YeS5052 disk. Then they are loaded into the main memory models (the P data file) (as proves necessary). Thereafter, the module called up in the P data file is processed instruction by instruction by the program interpretation. The program components of the minicomputer DOS, which control the input-output, are entirely replaced by the corresponding program models, incorporated in the interpreter. The following are included among such programs: the input-output supervisor; the program for processing system queries for input-output; and the minicomputer hardware drivers.

The following are included in the complement of program models for minicomputer DOS generation and starting: an absolute loader, a disk absolute loader, absolute drivers and the DISKD subroutine (the main disk driver), which is incorporated in the GENERATOR DOS program. The GENERATOR DOS program itself is interpreted instruction by instruction in the tool computer.

Generation Process Interpreting Principles. The interpreting of the GENERATOR DOS program takes the form of modeling the execution of each instruction by means of the special NINTER program. In this case, the DISKD subroutine is completely replaced in the interpreter by the corresponding program model. The functions of this program model include setting up exchange with the disk of the unified system of electronic computers. Moreover, one of the segements of the GENERATOR DOS program, which prepares this exchange, is not interpreted instruction by instruction. The preparation of exchange with the unified computer system disk is assigned to the DISKD program model. When interpreting, exchanges with the unified system disk are realized at the logic input-output level by means of direct access with identifier search. The transition is made to the DISKD subroutine model by means of picking-up the access to the DISKD subroutine. The absolute drivers are likewise completely replaced by the appropriate interpreter program models. The following program models have been developed for the absolute drivers: input from a keyboard printer (UPK), output to the UPK, input from a punched tape and output on a punched tape.

The functions of the absolute drivers are processed in the program models, while the exchange with the peripheral is itself accomplished at the physical level of unified system DOS input-output. Since the absolute drivers are not interpreted on an instruction by instruction basis, they are not fed in from punched tapes, but are limited only by the input into the interface locations of the addresses of the inputs into the driver. The interpreter has a directive language, where these directives are intended for entering information into the interface locations, necessary to provide for interception of the GENERATOR DOS program access to the absolute drivers and to transmit the control to the program models of the drivers. Moreover, by means of the entry directives, the initial address of the GENERATOR DOS program is established in the instruction number register model. Since the minicomputer DOS generation process is modeled on the hardware of the unified system of electronic computers, the absolute loader is likewise replaced by the appropriate program model.

The Functional Designation of Interpreter Components for Minicomputer DOS Generation. The process of generation begins with the operation of the absolute loader program model, which is fed in from punched tape to the data file P into the GENERATOR DOS program. Then the NINTER program begins to run. The entry directives are intitially inserted. Then, by utilizing the contents of the instruction number register, the initial address of the GENERATOR DOS program in data file P is computed. Then the cycle of instruction by instruction interpreation of this program begins.

The next instruction is selected from data file P, which is placed in the common KOM register of the tool computer. The analysis block for the kind of instruction transmits the control to the appropriate interpretation subroutine. The following kinds of interpreted instructions are differentiated: address instructions, shifts, changes in the register contents and omissions, the input of the contents of the keyboard register, operations with the overflow registers and stop instructions. Each of these types of instructions is interpreted by a definite subroutine of the NINTER program in accordance with the algorithm for their execution in the minicomputer. The generation of the true operand address in the common RTA register of the unified system of computers is modeled in the case of an address instruction. For transfer instructions, a new address is generated in the instruction number register and the appearance of instructions for accessing the absolute drivers and the DISKD subroutine is monitored. The data in the interface locations is used for this monitoring. With the appearance of instructions for transfer to the absolute driver, control is transfered to the appropriate program model of this driver with the subsequent return to the selection unit for the next instruction. Input from the keyboard register is modeled by input from the unified system computer console.

There is a difference in the interpretation of the NLT stop instruction from its execution in the minicomputer. The stoppage of the processor is programmed when executing a stop instruction in the minicomputer. There are no instructions in the unified system of electronic computers which cause a program stoppage of the processor. For this reason, the execution of the stop instruction is realized through the console of the unified system computer. With the appearance of the NLP instruction, the interpreter feeds cut the PRODOLZHIT' SChET? [CONTINUE RUN?] query to the operator on the console of the unified system computer; the unified system computer processor stops and waits for the operator's reply. In case a DA [YES] reply is received, the interpreter moves on to the selection and modeling of the next instruction. If the operator feeds out a NET [NO] answer, then the interpreter terminates its operation. We will note that the starting of punched tapes, which requires the shutdown of the central processor in the unified system computer, is interpreted in this fashion by means of the shutdown. The generation of the DOS on the unified system computer disk is completed with the message SYSTEM STORED ON DISC to the console of the unified system computer, by the appearance of the stop instruction, its interpretation and by receiving the NO reply from the operator.

Setting-Up the Execution of Minicomputer DOS Tasks by the Interpreter. The initial cycle of interpreting minicomputer DOS tasks is provided through the running of the program model for the disk absolute loader. Initially, this program model loads the resident portion of the generated variant of the minicomputer DOS from the YeS5052 disk into the model of the memory (data file P) and establishes the address of the starting point for the minicomputer DOS supervisor in the model of the instruction number register. Then control is turned over to the instruction interpreting program, which carries out the modeling of the execution of the control program instructions, the system programs and the programs of the minicomputer user.

The NINTER instruction interpreting program begins its operation with the input block for the interpreter's user directive, which are the auxiliary means of debugging the minicomputer programs by means of the interpreter. Then the NINTER program calculates the address of the minicomputer DOS supervisor starting instruction in the memory of the tool computer. The next minicomputer instruction is chosen from the half-word with the computer address, where this instruction is placed in the common KOM register of the tool computer. Then the formation of the true address is modeled in the common RTA register of the tool computer. When interpreting the address instructions of the main format, with the exception of the control transfer (JMP) and the branch to subroutine (JSB) instructions, the NINTER program models their execution.

With the appearance of the JMP instruction, access to the $IORQ subprogram is checked (the input-output supervisor), which is included in the complement of the minicomputer DOS. In this case, the control is transfered to the IORQ program model, which, depending on the logic number of the device, shifts the control to the corresponding model program of the driver. The program model of the driver execute the input-output operation and organizes the return to the selection unit for the next instruction of the NINTER program.

If the next instruction is JSB, then the address of the operand is compared with the address of the $SYIO subroutine (the processing of system input-output qeries), included in the minicomputer DOS supervisor. When the addresses match, control is transfered to the SYIO program model, which generates the addresses of the query parameters and transfers the control to the IORQ program model. Thereafter, the control is transfered to the appropriate program model of the driver and following the execution of the input-output operation on the unified system computer, a return is made to the selection unit for the next instruction of the NINTER program. Moreover, the JSB instruction address is compared with the address of the $TRIP subroutine (triplet generation). When the addresses match, the data buffer address is generated, the address of the next instruction is entered in the instruction number register and the running of the $TRIP subroutine is thereby circumvented. In all remaining cases, when executing the JMP and JSB instructions, a new instruction address is generated which is entered in the instruction number register, and the subsequent instruction will be selected by the NINTER program using this address, thereby modeling the control transfer.

The execution of the remaining types of instructions is modeled by the appropriate subroutines in accordance with the logic for their execution in the minicomputer, and the control is returned to the unit for selecting the next instruction.

Input-Output Interpretation Principles. There are substantial differences in the organization of the input-output for the tool computer and the one being interpreted. Access to all peripherals in the unified system of electronic computers is realized only through a channel controlled by the corresponding channel program. In a minicomputer, there is the capability of accessing peripherals either directly or through a processor, or by utilizing a channel, or even both together. There is the capability in the unified system of computers of exchanging in blocks of arbitrary length by means of one instruction, while in the minicomputer, the exchange is handled only with 16-bit words. Each minicomputer peripheral has its own specific control data structure, which differs from the structure of the control data for the unified system computer peripherals.

Thus, algorithms of the minicomputer driver program models in the unified system computer differ substantially from the algorithms of the minicomputer drivers themselves, although functional correspondence should be assured between the program models and the prototypes (the drivers in the actual minicomputers).

In the given method of constructing the interpreter, all of the minicomputer DOS programs, which control the input-output, are replaced by the corresponding interpreter programs. The SYIO program model, which replaces the $SYIO supervisor program, generates the system query parameter addresses and transfers the control not to the driver, but rather to the IORQ program models. Moreover, the programs which model the driver hardware functions are not broken down into two sections, since returning from the driver models to the program model of the input-output supervisor occurs upon the completion of the entire input-output operation. The wait program WAIT of the minicomputer DOS is replaced by the unified system DOS WAIT macroinstruction, which is incorporated in the program model for the drivers of the minicomputer peripherals.

All of the interrupts from the input-output hardware are processed by the unified system DOS, and for this reason, the interrupt supervisor of the minicomputer DOS is bypassed. There is no branch to the subroutine for completing the supervisor input-output, since the functions of monitoring the accessability of the peripherals are performed by the unified system DOS itself. The program models of the drivers do not use an equipment table, since the query parameters are chosen from the store locations indicated by the user. Moreover, the program models of the drivers, in contrast to the prototypes, can service only one of the peripherals simultaneously, using the physical addressing of the unified system DOS hardware in this case.

The organization of interchange with the disk in the interpreter differs substantially from interchange with the disk in the minicomputer DOS. In the minicomputer DOS, the user specifies the initial buffer address, the length of the buffer and the initial number of the tracks and sector. Based on this information, the supervisor generates information in the form of triplets for each track (disk address, main memory address, length in words), which are used in the operation of the drivers. In the case of system queries for exchange with the disk by means of the $SYIO subroutine, the address of the triplet buffer is specified within the query parameters. For this reason, accessing the $TRIP subroutine for generating the triplets precedes the accessing of the $SYIO subroutine of the minicomputer DOS supervisor. The program model of the DISC disk driver itself organizes the transition to th next track. For this reason, the triplets are not generated, and it is only necessary to specify the initial buffer address, its length and the initial address of the disk. This information is contained in the user queries. In the case of system interrogations, the requisite parameters are found in the data buffer when accessing the $TRIP subroutine. For this reason, the interpreter intercepts the $TRIP subroutine of the minicomputer DOS supervisor, stores the data buffer address and circumvents the execution of the $TRIP routine itself. When accessing the $SYIO subroutine for system interrogation processing, this data buffer is used to generate the interrogation parameters. The input from a punched tape, output on a punched tape and input-output from the unified system computer console are accomplished at the physical level of the unified system DOS input-output.

In contrast to the minicomputer keyboard printer drivers, where the input-output is organized on a byte by byte basis, in the program models for the drivers of the keyboard printer, the entire specified text is fed in or out by means of one instruction channel of the unified system computer. The information for generating the channel instruction is taken from the user's interrogation. The functions of the program models for the keyboard printer drivers includes the recoding of the information when setting up the input-output. This is related to the difference in the data coding for the corresponding unified system computer and minicomputer hardware.

Modeling the input from a minicomputer punched tape, just as in the program prototype, is accomplished on a byte by byte basis (one channel instruction of the unified system computer feeds one byte in or out). After feeding one byte in or prior to feeding it out, the symbol is processed depending on the format of the transmitted data, indicated in the control word of the query. In this case, the symbol processing algorithms completely correspond to the UVVPL and UVPL driver algorithms and control is returned to the NINTER program model following the completion of the input-output of all of the information indicated in the interrogation.

Exchange with a disk in the interpreter is accomplished at the input-output logic level of the unified system DOS by means of direct access identifier search. The DISC disk driver program model converts the information from the interrogation into the track and [illegible]te indicators. Accessing the unified system computer disk is accomplished by means of a unfied system DOS macroinstruction. The disk driver program model follows the moments of transfer to the next track of the disk during the exchange process, and only upon the completion of the entire exchange does it return the control to the IROQ program model.

The printout driver program model utilizes the logic level for output on a alphanumeric printer. The data is initially forwarded from the user's buffer in portions of 120 codes each to the output buffer of the unified system computer, is recoded, and is printed out by means of a unified system DOS macroinstruction. The printout driver program model monitors for the moment of completion of the output operation and returns the control to the IORQ program model.

Since a unified system computer does not have hardware for preparing symbol data on punched tape in the minicomputer codes, and when debugging the routines for minicomputers in the interpretation mode on the unified system computer it is necessary to introduce the symbol data (directives and programs in the input languages), then it has been made possible in the interpreter to feed the symbol data in from punched cards in the unified system computer code. The symbol data input hardware is determined by the IRT directive. If the input is realized from punched cards, control is transfered to the punched card input program. Otherwise, the punched tape input program operates.

The program which executes the punched card input introduces the symbol data into the interpreter buffer, recodes it in the minicomputer code, sends it to the buffer indicated in the minicomputer program interrogation and returns the control to the IORQ program model.

Service Capabilities of the Interpreter. The interpreter possesses the following supplemental tools for debugging programs for minicomputers:

--Data printout on the execution of each instruction;

--Data printout on all instructions performed with a specified address;

--Printout during read-write of data from a specified address;

--Stopping the interpreting process when executing an instruction with a specified address makes it possible to continue the interpreting of the minicomputer program;

--Entering data into the models of the registers and the minicomputer memory in octal form.

All of the indicated user actions are realized by means of a debugging directive language. The debugging directives are specified in the form of a control data file, which is inserted at the start of the running of the NINTER program. There is the capability for the supplemental input of directives during the process of interpreting minicomputer programs. A number of directives are executed immediately following their input, while with the input of other directives, the data is stored in the appropriate references of the interpreter. The execution of each instruction by the interpreter is accompanied by a check, to see whether the event caused by the debugging directives has entered the minicomputer program.

In the case where such kinds of events have been entered, actions are performed which correspond to the given directive and the process of interpreting the instructions continues.

The Technical Specifications of the Interpreter. All of the interpreter components are realized in the assembler language of the unified system DOS. The programs are debugged on the M4030 computer. A main memory with a volume of 76 K bytes is necessary for the operation of the interpreter. Two magnetic disks are used as the peripheral memory. The program interpreter is called up from the resident disk in absolute modules, while the working disk interprets the peripheral memory of the minicomputer. Moreover, the following unified system computer hardware is used for the operation of the interpreter: the console, the punched tape reader, the punched tape printer, the alphanumeric printer and a punched card input unit.

The minicomputer program delay coefficient during interpretation is about 8 to 10. The minicomputer DOS generation time on the interpreter is five to six hours.

Conclusion. A means has been developed for producing the software and routines for minicomputers on unified system computers. The interpreter makes it possible to execute all of the minicomputer DOS tasks on a unified system computer without any limitations. In this case, the delay coefficient of program execution in the interpreting mode is permissible [6].

The given approach can be used in constructing interpreters for other classes of minicomputers and other operating systems. In the realization of this method, it is essential to segregate the programs of the operating system, which control the input-output, to construct the models of these programs and when modeling the execution of instructions, to intercept the access to the programs which control the input-output, replacing them with a branch to the appropriate program models. When setting up the interpreter for the M7000, SM-1, and SM-2 minicomputers for other operating systems, only the subroutines for modeling the execution of the JMP and JSB control transfer instructions are changed in the NINTER program, in the plan for tying-in to the addresses of subroutines which organize the input-output in the given operating system. Those portions are changed in the program models of the drivers which interpret the driver functions, related to the operating system. The portions of the program models of the drivers which set up the process of exchange with the peripherals remain unchanged. The program models of the input-output supervisor and the program for processing system interrogations are replaced by program models for programs which perform similar functions in the operating system being interpreted. If there are still some programs which participate in organizing the input-output in a given operating system, then the appropriate models for these programs are added to the interpreter.

Thus, the given technique for constructing an interpreter requires knowledge of the operating system which is to be interpreted, something which is responsible for definite difficulties in the realization of this technique. On the other hand, the substitution of the programs of the minicomputer operating system which control the input-output by their program models on the tool computer is one of the ways of boosting the interpreting speed and leads to a permissible delay. Moreover, as compared to compilers and cross-systems [2, 3, 5], this method possesses two aditional important advantages. First of all, the interpreter is invariant with respect to the composition of the minicomputer software, especially in the case where it is built up. Secondly, complete interpreting of minicomputer operations and its system programs makes it possible to catch situations related either to incorrect utilization of the minicomputer DOS or to the organization of actual exchanges. These interpreter capabilities are extremely important when developing systems operating in real time.

The interpreter has been turned over to the sectoral fund of algorithms of the Central Programming Systems Administration. The interpreter has been utilized in debugging programs for the ASUTP [automated control system for production processes] of the "Druzhba" oil pipeline, as well as individual programs of the ASUTP of the Gomel' Chemical Plant.

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PROGRAM PREPARATION SYSTEM FOR K580IK80 MICROPROCESSOR

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 (manuscript received 17 Jul 80) pp 71-72

[Paper by Yu.I. Artemov, V.L. Vyalov, V.P. Rudobaba and Ye.A. Taran]

[Text] A program preparation system for the K580IK80 microprocessor was designed and is successfully operating at the Institute of Automation (Kiev). The system is based on the small ASVT [modular system of computer technology] M6000 control computer and makes it possible to debug the microprocessor program in a dialogue mode. The system incorporates a hardware-program interpreter, a debugger, a cross assembler and a display editor for symbol data.

The interpreter is intended for processing the instructions of microcomputers, which incorporate a type K580IK80 or Intel-8080 microprocessor. The interpreter hardware is the K580IK80 microprocessor, which is connected through a 2 K interface and two duplex registers (see the figure) to the M6000. A microprocessor state byte is established by means of a special register. The execution of the instructions is accomplished in cycles. Following each cycle, data is exchanged via the data bus between the M6000 and the microprocessor. In this case, the microprocessor address bus is used, as well as the WAIT signal, which is evidence that the microprocessor is ready to exchange information, and the READY signal, which confirms the fact that the data are ready for input into the microprocessor. The program for data exchange between the M6000 and the microprocessor is rather simple and takes up less than 1,000 words of the M6000 main memory.

The debugger takes the form of a program, the functions of which are realized in many minicomputers by means of special consoles:

--Reading the region of the M6000 memory which contains the program in the microcomputer codes;

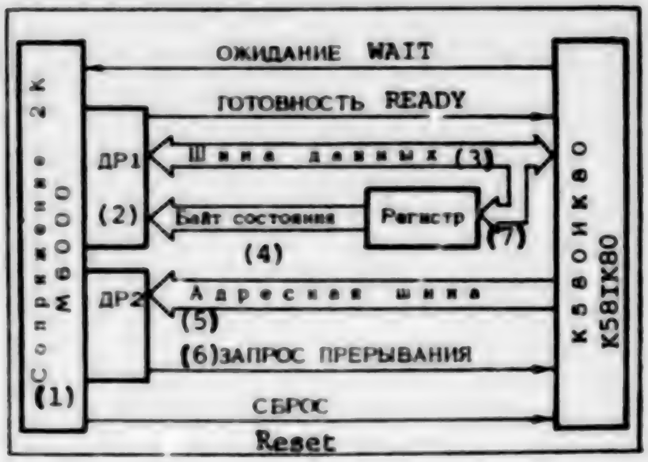
--Making changes in this program;

--Entering the requisite address in the instruction number register;

--Running the microcomputer program in an automatic mode;

--Organizing debugging shutdowns (on instruction, upon accessing a specified address or based on the input-output);

--Step by step running of the program with the indication of the contents of the registers.



Key: 1. M6000 2K interface;
2. DR1 [driver 1];
3. Data bus;
4. State byte;
5. Address bus;
6. Interrupt query;
7. Register.

Moreover, the debugger makes it possible to model input-output and interrupts. The role of the microcomputer console is played by the SID-1000 display, on which the following are printed out during the process of running the program of the microprocessor: the contents of the common registers, the accumulators, the instruction number register, the code of the instruction being executed, the reason for a stoppage, etc. For example:

```
(1)  (2)   (3)  (4)   (5)  (6)   (7)  (8) (9)
РНК  ЦИКЛ  АВТ. ОСТ.: КОМ  ЧТЕН. ЗАП. В/В АДРЕС
0040 C3    •          •
                                          0045
A:00 B:1E C:3F D:00 E:FA H:20 L:9D
```

Key: 1. Instruction number register; 2. Cycle; 3. AVT [expansion unknown]; 4. Stop; 5. KOM [?to whom?]; 6. Read; 7. Write; 8. Input-output; 9. Address.

The debugger can operate in two modes when modeling input-output procedures. In the first of them, a buffer is designated as the input device being used in program being debugged, where this buffer is filled from the display screen. When an instrucation is executed by the debugger, the input from the buffer is read by the next data byte. The output buffer is common to all of the output hardware. When executing an output instruction, two bytes are written into the buffer: the first is the number of the device; the second byte is an information byte. The output buffer is also viewed on the display screen.

The second mode makes it possible to model microcomputer operation with real input-output hardware. The debugger incorporates two tables in its complement: an input table and an output table, where the address of the driver for the output device being used is contained in the M6000 codes for each number of this device. When the microprocessor shifts over to the input state, the number of the device from which the information is to be fed in is read from the microprocessor address bus. The address of the appropriate driver is determined based on the input table and control is transfered to it. Following the data input into the tool computer, the information byte is fed out to the microprocessor data bus.

Similar operations are also performed during output. In this case, the information is picked off of the data bus and transmitted to the corresponding driver, which feeds it out to the actual device.

As is well known, the most labor intensive operation is debugging programs which operate in an interrupt mode. For this reason, there are two methods of modeling interrupts in the system. In the first technique, during the running of the microprocessor program which is being debugged, a directive which generates the interrupt is fed in from the display. The number of the "interrupting" device should be indicated in it. An interrupt query signal is sent to the microprocessor, where this signal is processed by the program being debugged as an ordinary interrupt query from a peripheral.

The second method is intended for more precise study of the interrupt processing mechanisms of the program being debugged. In this case, any program instruction can be tagged with an interrupt marker, indicating the number of the "interrupting" device. The interrupt query signal is generated when selecting this instruction from the memory during the running of the program being debugged. Thus, one can model interrupts with as small a time interval as desired.

The cross assembler and the display editor for the symbol data, which are incorporated in the system, make it possible for the programmer to repeatedly correct and translate the original program without its intermediate outfeed to peripherals, as well as to place the target program in the region of the memory being used by the debugger.

A merit of the program preparation system described here for the K580IK80 microprocessor is the fact that it occupies a small main memory volume (12 K words) does not require the utilization of peripheral memory stores and makes it possible to debug programs in a dialog mode. In this case, a broad set of service is made available to the user.

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NONPROCEDURAL RELATIONAL DATA PROCESSING LANGUAGE FOR NONPROFESSIONAL COMPUTER USERS (DNEPR)

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 (manuscript received 16 Jun 80, after revision 26 Nov 80) pp 76-81

[Excerpts from paper by L.V. Vernik, I.M. Vinitskiy and Ye.N. Shalashinskaya]

[Excerpt] Introduction

The relation model of a data base proposed by Codd [1] served as the basis for the creation of a large number of powerful and convenient relational data processing languages for nonprofessional users; papers [2-4] are devoted to a description and comparative analysis of these languages.

Some three groups of relational languages have come to be distinguished at the present time:

--Declarative languages, based on a relational calculus (for example, the DSL-α language [5] and the *query by example* language [6]);

--Procedural languages, based on a relational algebra (a typical representative of such languages is RYaOD [7, 8];

--Languages which utilize the concept of mapping (for example, the SEQUEL languages [9]).

The declarative relational language DNEPR, developed in the Scientific Research Institute for Psychology of the Ukrainian SSR, is described in this paper. The language can be treated as a nonprocedural analog of the RYaOD language.

On the Realization of the DNEPR Language

In 1979, a simplified version of the language was realized in the AIPS-DNEPR automated information retrieval system.

The system operates in a batch mode using the operating system of the unified computer series of the versions 4.0 and above. A minimum operating memory of 90 K is necessary for system operation.

The AIPS-DNEPR consists of the followign major units (see the Figure): the description translator, data input and correction, query interpreter and the output document printer.

The system presupposes the organization of data in the form of homogeneous data files and a set of references. The coded values of the operations being taken into account are stored in the main data files, while their names are stored in the references.

The query interpretation and requisite data retrieval program is referenced to the description of the data files, where this description is generated for each specific AIPS-DNEPR application in any subject field. The input of the data files and their subsequent correction are likewise accomplished in accordance with this description. The description is produced in RYaOD and takes the form of a set of operators for declaring the data files.

At the present time, AIPS-DNEPR is being utilized in the PRAVO [LAW] system (accounting for legal documents) and the ShAKhMATY [CHESS] (accounting for games which have been played).

The AIPS-PRAVO data base consists of four main files and four reference files. The data on the legal documents under consideration is contained in the main data files as well as the appendices to them, the amending legal documents, as well as the titles of the documents and appendices. The references contain information on the designations of the kinds of documents, their thematic association, on the issuing organs and the official sources.

There is one main data file in the AIPS-ShAKhMATY, the size of which characterizes the chess game, and three references, which contain the name of the opening, the name of the tournament and the text of the game with commentary.

Experiments are underway at the present time in Institute of Psychology of the Ukrainian SSR to ascertain the advantages and drawbacks of the DNEPR language as compared to the existing relational SEQUEL [9] and *query by example* [6] languages. The preliminary results have shown that the DNEPR language does not require a high level of mathematical training from the user, is syntactically simple and is easily mastered.

Also to be included among the merits of the language is the capability of its efficient utilization in a remote processing mode.

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APPLICATIONS

ECONOMIC EFFICIENCY OF PHASE TWO OF AUTOMATED SYSTEM FOR STATE STATISTICS (ASGS) EVALUATED

Moscow VESTNIK STATISTIKI in Russian No 6, Jun 81 pp 48-54

[Article by L. Mendelevich: "Economic Efficiency of Phase Two of the ASGS"]

[Text] The "Main Guidelines for the Economic and Social Development of the USSR for 1981-1985 and for the Period up to 1990" indicated the necessity of "improving the quality and efficiency of accounting and statistics and of improving accounting documentation and reporting in all components of the national economy as applied to modern requirements for controlling, planning and analyzing economic activity with the efficient utilization of computer technology."

The main goal of the development and introduction of the ASGS is also the most complete satisfaction of administrative and planning agencies with regard to the necessary information while shortening the time required for processing it. On this basis also is determined the economic efficiency of the ASGS, realizable chiefly along two lines: The first is intensification of the analyticity (information content) of statistical data processed, the introduction of additional analytical profiles and improvement of the reliability and level of statistical economic analysis; and the second is the reduction of labor and material costs for the processing of data and for its deeper analysis.

Nineteen eighty was the concluding year in the development and introduction of phase two of the ASGS, whose main feature is the expansion and intensification of the program for the development of electronic data processing complexes, the development and introduction of phase one of the automated data bank (ABD) and the system software, and the introduction of mathematical economics methods for the purpose of a deeper analysis of socioeconomic processes of the national economy.

Thus, the functional subsystem "Industry Statistics," along with work on the introduction of electronic data processing complexes and their improvement, solves in a qualitatively new aspect the problem of the statistical economics analysis of the efficiency of public production. This problem covers in its latitude all lines of industry statistics--statistics on production, labor and wages and technical and economic indicators and, primarily, the utilization of fixed capital and production capacities--relating to the considerable potential of industrial production. The system of extended analytical indicators produced thereby and obtained on the basis of an overall and factor analysis of the efficiency of public production and of other developments makes it possible to study the potential and losses in this sector of the national economy in terms of the sources of and reasons for their formation, which makes it possible to make goal-directed decisions relating to their realization.

The analyticity of information processed in the functional subsystem "Agricultural Statistics" has been improved considerably. An extended analysis of the efficiency of agricultural production, investigation of trends in alteration of the key indicators of the operation of agricultural enterprises, taking into account the factors influencing them, as well as in terms of time history, and the forecasting of rates of growth and the growth of agricultural production have been performed with the utilization of mathematical economics and statistical methods.

Improvement of the quality of information in the "Capital Construction Statistics" functional subsystem has been made possible chiefly on account of deepening of the information content of indicators, the introduction of additional analytical profiles in processing and expansion of the range of problems solved. For example, the introduction of the "Combined Study of the Status and Progress of Construction of Enterprises and Sites" complex, based on the use of the register form of statistical control, has made it possible to accomplish control of the most important construction projects and sites under way from the beginning of construction to entry into service, to exhibit the change in the estimated cost and individual capital investment for individual construction projects and to make a factor analysis of reasons for deviations of actual costs from planned and projected. The processing of this information will make it possible more efficiently to make decisions regarding speeding the entry of sites into service and will also be conducive to improving the efficiency of the utilization of capital investment.

The introduction of budget statistics complexes based on the use of methods of mathematical statistics has made it possible to obtain a wide range of indicators characterizing the degree of satisfaction of the material and cultural needs of various social groups of the population in terms of a number of socioeconomic criteria.

The analyticity of information processed in the "Materials and Equipment Supply Statistics" functional subsystem has been increased on account of the extension of the analytical properties of information making possible the analysis of reasons for deviations in the actual consumption of materials from the norm, the introduction of additional processing sections, and expansion of the list of kinds of raw material, materials, fuel and energy taken into account.

Taking into account the fact that considerable potential for the saving of capital in the national economy resides in ensuring the timely entry of equipment into service, in the EOI [EDP (electronic data processing)] complex (form No 1 and No 2) the processing of new reports and groupings has been provided for, which most fully characterize the presence and distribution of uninstalled equipment in terms of region and departmental jurisdiction. The program for development of the complex calls for the site-by-site record of the existence of uninstalled expensive and unique equipment, as well as of the time it remains in warehouses and in installation, which makes it possible for administrative agencies to take effective measures to speed its introduction into service.

For the "Statistics on Culture and Science" functional subsystem new indicators were introduced which make it possible to characterize more profoundly the fruitfulness of scientific developments in terms of branches of science and the national economy as a whole, as well as the distribution of the total number of VUZ and scientific research institute personnel with an indication of the level of their scientific skills.

The automation of data processing and thorough control of it on the basis of using computers have made it possible not only to improve the quality but also to reduce the labor intensiveness and cost of processing data. For example, the labor of 537 persons was expended in 1975 on processing data at a cost of 1 million rubles, and of 407 persons in 1980. Reduction of the labor intensiveness of data processing has made it possible to process ever increasing amounts of information without substantially increasing the number of personnel. For example, with a 64-percent growth in the amount of information in 1980 as compared with 1975 the number of personnel was increased by only 24 percent, and the number of personnel in departments for the preparation and output of statistical data increased only 16 percent during this period as the result of a reduction in the expenditure of manual labor for checking information.

For a more extended estimate of the effectiveness of individual measures relating to the introduction of phase two of the ASGS, the USSR Central Statistical Administration (TsSU) Scientific Research Institute made a study of the space-time characteristics, labor intensiveness and cost of processing for electronic data processing system complexes, as well as for complexes being developed at the Union level.

Data, obtained on the basis of this study, on the reduction of processing time for the most information-intensive complexes are presented in table 1.

Table 1. Reduction of Processing Time of KEOI's [Electronic Data Processing Complexes] in 1979 as Compared with 1975 (in Days)

Reporting forms on the basis of which EDP complexes are developed (No)	Republic computing centers of Union republic central statistical administrations		USSR Central Statistical Administration Central Computing Center		
	Semiannual	Annual	Quarterly	Semiannual	Annual
22		13-14			14
11		12			14
8 (sections I and II)		15			
8 (section III)		15-20			7
2-t (quarterly)	9		3		
1-sn		7-10			
5-ps					10
NO-1, NO-2					40*
2-nk					59
3-nk					64
5-nk, 10-d, 10-prk		19-41			3

[Continued on following page]

1-t (quarterly)		5	
2-tr	2		10
5-nt			18
19			10
19 (brief)	2-10		
"Key Indicators of Annual Reports of Kolkhozes and Sovkhozes"	5		5

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*Processed at the USSR Central Statistical Administration Central Computing Center.

The data of the research have also demonstrated that the leading rate of growth in the amount of work as compared with the cost of processing it made it possible to provide a reduction of the cost for 1000 indicators to 8.2 rubles in 1979 as compared with 8.7 rubles in 1975.

The labor intensiveness of data processing in departments for the preparation and output of statistical data relating to EDP complexes was reduced in 1979 to two man-hours on average per 1000 indicators, as compared with 2.3 man-hours spent in 1975.

Table 2. Savings from Reduction of Processing Costs of KEOI's

Reporting forms on whose basis EDP complex has been developed (No)	Reduction of specific costs in 1979 vs. 1975, %	Savings from introducing complexes in 1979 as compared with 1975	
		Total, 1000 rubles	Including on account of reduction of computer machine time costs
1-t	25.3	362	253
22	15.2	121	70
8 (sections I and II)	24.7	99	80
11	20.6	85	46
1-s	13.5	67	52
4-t (industrial)	11.6	58	36
3-t (quarterly)	15.8	113	84
3-t (brief)	11.8	69	54
KEOI-1, "Routine Processing of Budget Study Data"	6.0	92	71
19 and 19 (brief)	14.6	68	56
"Key Indicators of Annual Reports of Kolkhozes and Sovkhozes"	6.3	48	26
4-nt	12.7	44	38

Table 3. Reduction of Processing Labor Intensiveness of KEOI's in Departments for Preparation and Output of Statistical Data

Reporting forms on whose basis EDP complexes have been developed (No)	Reduction of specific labor intensiveness in 1979 vs. 1975, %	Additional number of man-hours which would be required for the processing of complexes in 1979, in terms of specific labor intensiveness of 1975 (for the computing system of the USSR Central Statistical Administration as a whole)
1-sn, 2-sn, 4-sn	30.0	125,470
KEOI-1, "Routine Processing of Budget Study Data"	16.0	100,000
NO-1, NO-2	35.0	92,993
1-t	19.0	77,800
"Annual Reports of Kolkhozes and Sovkhozes"	27.0	43,200
22	19.0	24,000
3-t (quarterly)	18.0	28,000
3-t (brief)	12.0	18,300
2-t	11.0	24,000
11	14.0	8700

The reduction of the labor intensiveness of processing is characterized by the data in table 3 for the most labor-intensive and information-intensive complexes.

One factor for ensuring a direct savings from the introduction of the second phase of the ASGS is the introduction of the ABD [automated data bank]. This savings is formed on account of the minimum possible entry of raw data and the obtainment on its basis of a large array of resourceful analytical information, which makes it possible to reduce the cost both per unit of data processed and for the entire volume of it.

The reduction of costs for the input of data is achieved on account of the one-time entry of data and the accumulation of data in terms of time history over a number of years. Data are entered according to a unified technological system and by means of standard software, which does not require added costs for its development and mastery.

The savings in processing data according to unregulated interrogations is formed on account of the reduction of expenditures of time for the processing and output of data. An estimate of the effectiveness of the introduction of phase one of the ABD, made on the basis of a technique developed by the Belorussian branch of the USSR Central Statistical Administration VGPTI [All-Union State Planning Technology Institute] demonstrated that at just the Belorussian SSR Central Statistical Administration Republic Computing Center the nominal annual savings equals more than 300,000 rubles, 240,000 of this from the reduction of costs in connection with the development of additional analytical data. From this it follows that the extensive introduction of ABD's opens up broad opportunities for reducing the cost of data processing.

The savings from the introduction of a statistical data teleprocessing system (STOSI) is made possible primarily on account of the improvement of the reliability of and reduction of the time for transmitting information. In turn, reduction of the data transmission time creates the prerequisites for economizing on costs for payment for the time of existing communications channels. Estimates made in the engineering work project of phase one of the STOSI demonstrated that the anticipated annual savings from introducing the STOSI as compared with the use of DFYe-550 data transmission equipment can be estimated approximately at 1.2 million rubles. At the present time the STOSI is at the stage of experimental utilization, because of which data on the anticipated savings can be refined.

One source of producing a direct savings is the extensive introduction, being carried out at the present time, of work relating to the unification of statistical reporting based on the utilization of all-Union classifiers and systems of notation. Estimates made by the USSR Central Statistical Administration Scientific Research Institute, on the basis of amounts of statistical data arriving and of reduction of the expenditure of time for processing data associated with filling in the names and codes of objects, control and the correction and punching of entering data, have shown that the nominal annual savings from the introduction of all-Union classifiers into statistical reporting practice equals approximately 1.5 million to 2 million rubles.

The savings is calculated by the equation:

$$V_1 = P_1 \cdot (t_1 - t_2) \cdot R_k ,$$

where P_1 is the number of primary documents in which OK TEI [all-Union classifier of technical and economic data] codes are used; t_1 and t_2 represent the time for processing a single document before and after the introduction of OK TEI's, respectively; and R_k is the mean annual wages of personnel working on the primary processing of documents.

An important source for ensuring the effectiveness of the introduction of phase two of the ASGS is improvement of the level of the utilization of computer technology, which is achieved primarily on account of a further improved data processing technology ensuring the intelligent utilization of computers and the revision of norms for the expenditure of machine time.

The improvement of computer utilization made possible an approximately 25-million-ruble increase in the volume of work, representing a savings of about 5 million rubles.

Data characterizing the rate of growth of the utilization of individual kinds of computers during 1976-1980 (in machine-hours) are presented in fig 1.

Phase two of the ASGS represents the period of the mastery of new software, ABD's, the STOSI, system software and other developments. The extensive introduction of these system developments will be accomplished during 1981-1985. It follows from this that in phase three of the ASGS the potential possibilities for improving the effectiveness of the utilization of labor and material resources, computer technology and capital investment will be more considerable.

In the process of the development of phase three of the ASGS it is necessary to improve the methodology for estimating the economic efficiency of the ASGS while isolating the savings from measures relating to the development of statistical data, as well as for outside customers; it is also necessary to develop a methodology for estimating the indirect savings produced on account of potentials and ways of realizing them discovered in the process of the development of statistical data.

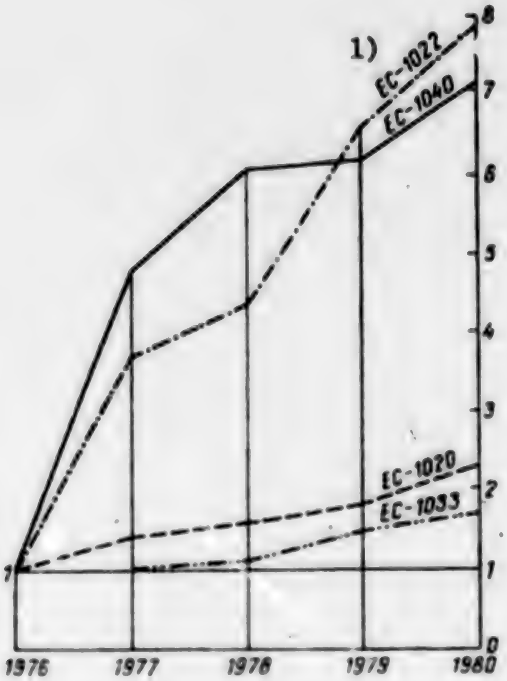

Figure 1. Rates of Growth in the Utilization of Individual Kinds of Computers

Key:

1. YeS-1022

Taking into account the fact that the determination of effectiveness must be based on the employment of norms for the cost of equipment and labor, as well as on norms for the utilization of computer equipment, capital investment, etc., it is necessary to carry out a complex of measures for improving them. This is due to the fact that in computing centers the costs of equipment and labor for the same kinds of work differ considerably. It is necessary to develop for each complex or problem scientifically substantiated norms for the cost of equipment and labor for individual processing stages (with small machines, with computers and in statistical data preparation and output departments), as well as norms for specific capital investment. The development of these norms will make it possible to plan with better substantiation the distribution of computing system resources, as well as to control their utilization.

For the purpose of revealing the effectiveness of the introduction of individual complexes and statistical problems in the primary record keeping of the computing system of the USSR Central Statistical Administration it is necessary to provide for individual accounting for them and for calculation of costs as a whole, as well as for production stages in the processing of complexes and problems.

In addition to cost indicators for the volume of work, it is necessary also to keep account of it in a physical calculation (in thousands of indicators). This is because of the fact that the growth in the physical amount of data with the introduction of EDP complexes, in association with the obtainment of derived analytical data, outstrips the rate of growth of costs for processing them, which makes possible a substantial reduction of costs per unit of data to be processed (thousand indicators). In addition, systematized record keeping of the amount of work in thousands of indicators makes it possible to plan with greater substantiation the distribution of and the keeping of records of the utilization of computer equipment in the computing system of the USSR Central Statistical Administration.

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RSFSR AUTOMATED CONTROL SYSTEM STATUS

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 6, Jun 81 pp 25-32

[Article by N. Zenchenko, deputy chairman, RSFSR Gosplan: "Automated Control Systems in the Republic's Socialist Economy"]

[Text] The volume of control and planning work is systematically increasing in association with the growth of the economy and the development of interindustrial ties in the national economy. It has become ever more difficult to solve by ordinary traditional methods problems relating to the control of modern production.

According to published data, at the present time 60 to 80 percent of control work is spent on working with information, 30 to 40 percent for obtaining it and 10 to 15 percent for transfer and primary processing, and 20 to 25 percent involves computations and analysis. Nevertheless a considerable portion of the information is not taken into account in making decisions and this is certainly expressed in the quality of them.* The development of science and engineering has provided a powerful tool for solving this problem in the form of computer facilities making it possible to gather and store a large amount of information, to process it at high speed and to obtain results in the form required.

The key trends in the utilization of hardware components and mathematical economics methods in the national economy have already been formed at the present time. These include the automation of the processes of planning and control at enterprises, in associations, ministries and departments at the republic and statewide levels; the creation of automated systems for controlling technological processes; the development of automated design systems in construction; and the utilization of computer technology for carrying out scientific research and for automating the educational process in higher and secondary educational institutions. The creation of automated systems for various control levels and entities represents a steady job in improving control of the national economy.

Problems relating to the introduction of computer technology and mathematical economics methods have been reflected in documents of the 26th CPSU Congress. The republic's planning and economics agencies and local councils of people's deputies, executing the congress's decisions, have been called upon to intensify work relating to further improvement of planning of the national economy and of controlling it with the employment of modern computer technology and mathematical economics methods.

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*Cf. A.M. Omarov, "Upravleniye ekonomikoy" [Economic Control], Moscow, Ekonomika, 1979, p 399.

Status of the Development and Introduction of Automated Systems of Planning and Control

In the RSFSR the general trend of the introduction of computer technology in planning and control is represented by work on creation of the ASU-Rossiya [Russia Automated Control System] automated control system. The engineering assignment for its development was approved in 1976 and a coordination plan for work on creating the first phase was adopted in 1977. According to the engineering assignment the ASU-Rossiya is an integrated complex of compatible and effectively interacting automated systems for controlling and processing the data of directive, interindustrial, industrial and territorial control agencies within the jurisdiction of the RSFSR Council of Ministers and constructed on a unified mathematical, organizational-legal, information, hardware and software basis.

Three levels are distinguished in the structure of ASU-Rossiya entities:

The directive, at which an automated data processing system is created for directive agencies--the RSFSR Supreme Soviet and the RSFSR Council of Ministers.

The interindustrial, at which lie the automated control systems of 11 interindustrial control agencies--the RSFSR Gosplan, the RSFSR Ministry of Finance, the RSFSR Gosstroy, the RSFSR State Committee for Prices, the RSFSR Central Administration of Materials and Equipment Supply and Marketing, the RSFSR State Committee for Petroleum Products, the RSFSR Central Statistical Administration, etc.

Territorial-industrial, at which lie the industrial automated control systems of RSFSR ministries and departments and territorial automated control systems of local agencies--of autonomous republics, krays, oblasts, and of Moscow and Leningrad.

In the 10th Five-Year Plan period work was actively done on seven interindustrial entities of RSFSR ASU's, 27 industrial and four territorial. The first phases of these systems have already been put into service in a number of organizations. Some ministries have begun the development of the second phase of industrial ASU's.

Automated systems have found the most extensive use in industry. In many instances the entire plant cycle (from the preparation of decisions to supervision of the work of equipment and people) is under the observation of computers; by their means, at any moment, taking into account available resources and the requirements of the plan, optimum working conditions are maintained for the purpose of achieving the best final results in terms of production volume, nomenclature, profitability, profit, etc. The data of an ASU make it possible to judge the performance of an enterprise, beginning with accounting for the consumption of materials and resources and ending with precise control over product output, and to check systematically fulfillment of the plan.

The number of ASU's is growing steadily. For example, in the years of the 10th Five-Year Plan period in our country were created 2197 new automated systems for accounting, planning and control, including more than 1000 ASU's in the Russian Federation, 520 and 330 of them, respectively, in 1980. The production of computer technology hardware and spare parts increased by 14 percent last year and amounted to 4.5 billion rubles worth, including 2.1 billion rubles worth in the RSFSR.

In the course of the introduction of functional industrial ASU's it was revealed that for practically all key control functions (planning, accounting, analysis, operations control) algorithms can be developed for carrying them out by means of a computer. Practically speaking, the machinery of ministries processes primary documents (information obtained from enterprises on the status of production, directives from superior organizations and planning agencies, data on funds) into secondary (in the form of instructions for controlling enterprises, reports, statements, statistical information, etc.). Computers render inestimable assistance in this to control and planning agencies.

Obviously transportation is second after industrial production in terms of breadth of coverage with control automation. The Ministry of Motor Vehicle Transportation can serve as an appropriate example in the RSFSR. The industrywide combined ASU-avtotransport [motor vehicle transportation] system embraces all levels of control. Automated systems for the management of the ministry and motor vehicle repair shops and a system for controlling the transport of freight and passengers have been created within its structure on a unified methodological, information, software and hardware basis. In the ministry as a whole more than 1000 motor vehicle transportation enterprises utilize decisions prepared on a computer.

Considerable work on the creation of ASU's has been carried out in the RSFSR Ministry of the River Fleet. The first phases of 13 systems of various levels have been introduced here, including the industrial ASU-rechflot [river fleet]--in the central machinery.

In the RSFSR State Committee for Petroleum Products more than 60 problems of the planning and control subsystem are solved at the level of territorial administrations and the central machinery. These include primarily problems relating to drawing up optimum schedules for the transport of bulk forms of petroleum products, on-line control of deliveries and statistical reporting.

Considerable work on the creation of ASU's is being carried out in the RSFSR Ministry of Public Health, both at the ministry level and in oblast administrations and hospitals. For example, in Kemerovskaya Oblast an ASU for specialized medical services which has been developed and introduced is operating at high efficiency: Hospital bed turnover has been sped up 1.6-fold with a simultaneous improvement in the quality of medical aid. The introduction of an ASU in the dispensary service in Novokuznetsk and Izhevsk has made it possible, by releasing physicians from the job of filling in numerous accounting and reporting documents, to increase by 20 percent their time for contact with patients.

Still, nevertheless, such ministries as the RSFSR Ministry of Agriculture, Ministry of Fisheries, Ministry of Rural Construction, State Committee for Universal Labor Service, State Committee for Publishing and Gosstroy, have been temporizing in the development and introduction of ASU's. Computers on which very simple problems are solved have been acquired in a number of ministries and departments of the RSFSR.

The changeover from traditional manual calculations to the use of modern computer technology requires a definite reordering of existing forms and methods of control. The measures called for by the decree of the CPSU Central Committee and USSR Council of Ministers of 12 July 1975, "On the Improvement of Planning and Strengthening the Influence of the Economic Machinery on Improving Production Efficiency and Work Quality," have this aim. In this document the councils of ministers of Union and autonomous republics and the kray and oblast councils of people's deputies have been faced with new great problems. They must discuss the drafts of plans of associations, enterprises and organizations under Union jurisdiction and come forth with suggestions regarding them, keeping in mind insurance of the overall economic and social development in the territory in question.

Union and autonomous republics and the executive committees of kray, oblast and city councils of people's deputies have been entrusted with writing (on the basis of planning indicators) and approving overall five-year and annual plans for the production of building materials, consumer goods, and plans for municipal and residential and public service construction, as well as with overseeing the fulfillment of these plans. The tool for accomplishing these measures can be territorial ASU's being developed in oblasts, krays and autonomous republics. Moscow and Leningrad and Chelyabinskaya, Sverdlovskaya and Tomskaya oblasts have achieved the greatest successes in the creation of these ASU's and individual subsystems of them.

In Moscow, for example, they have been occupied with problems in automating the control of individual aspects of the urban economy since 1971. A major problem now is the creation of the ASU-Moskva [-Moscow] complex, representing an intercoordinated automated system for controlling the economy of Moscow and including citywide, rayon, interindustrial and industrial ASU's, ASU's for enterprises and associations, and also ASU's for technological processes.

Interesting work on the creation of an oblast ASU is being performed in Sverdlovsk. Mention should be made of the comprehensive approach of the people of Sverdlovsk to the problem of territorial planning and control, as well as of the good organization of work on solving it. ASU's for rayon and city entities are being created simultaneously with the development of higher-level entities of the oblast ASU and data links are being formed between territorial and industrial entities and the ASPR [automated control system for planning calculations] of the oblast planning commission.

Territorial automated control systems have also been introduced in Tomskaya Oblast. There is a good scientific and production base here and a strong team of ASU developers. A collective-use computer center (VTsKP) has been created, furnished with two computers--a YeS-1033 and YeS-1022, which have been extensively outfitted. In the oblast ASU system the following subsystems have been developed on the basis of the VTsKP: data processing for directive agencies, planning calculations, state statistics, urban economy, labor resources, capital construction, dairy cattle production, public education and "autosearch." The latter has won recognition far beyond the borders of the oblast. This subsystem makes it possible to plan with high precision the delivery of spare parts and fuel for each brand of machine, helps the GAI [State Motor Vehicle Inspectorate] to improve the control of traffic on roads, and puts out data on the technical condition of the fleet.

However, everything which has been done hitherto in the development of territorial ASU's is only the beginning. Many autonomous republics, krays and oblasts have essentially not yet begun to develop automated control systems.

ASPR's in the Practical Work of the RSFSR Gosplan and Local Planning Agencies

Automated planning calculation systems (ASPR's) have begun to play an ever greater role in planning. Seventeen engineering assignments, four engineering projects for functional subsystems and 155 problems entered the structure of the first phase of the RSFSR Gosplan ASPR in 1977. The second phase is under development now. At the present time the ASPR includes 38 subsystems, including 29 functional and nine support.

The efforts of developers and specialists of the RSFSR Gosplan machinery have been concentrated on the following: on broadening the coverage of subdivisions with automated calculations; increasing the output of planning documents in computer formats; changing from individual plans to overall objectives, making it possible to improve the intercoordination of the plan; and improving the systemwide facilities enabling the functioning of the ASPR. For these purposes assignments have been prepared for planning and introducing the second phase of the RSFSR ASPR, along with a coordination plan for work on the design and introduction of the ASPR, as well as a number of other methodological materials whose use will make it possible to begin implementation of the first stage in the second phase of the ASPR and will ensure its further development. A combination of tasks relating to controlling the arrival of data from ministries and departments in the yearly planning cycle has been introduced and is being used in the structure of the "Plan Development Process Control" subsystem.

At this stage 878 tasks, 88 percent of them in a system of 125 complexes including not less than two tasks, have been adopted for use for functional subsystems. Thus, at the first stage a backlog has been created in the development of complexes of tasks in the list called for by the assignment for the design and introduction of the second phase of the RSFSR ASPR. Of the 596 complexes of tasks to be introduced in the 11th Five-Year Plan period more than 10 have been surrendered in full. These complexes of tasks are included in the "Public Services" and "Building Materials" subsystems, and also in the "Capital Construction" module of a number of industrial subsystems.

The tasks used at the first stage are distributed in the following manner in terms of planning routines: four tasks are used in the routine of developing key trends, 53 in the five-year planning routine, 648 in the annual, and 173 at the stage of controlling progress in the fulfillment of plans for economic and social development.

Thus, the first stage of the second phase represents a relatively complete development of a system making possible on account of the use of the tasks introduced an improvement in the level of planning work and creating the necessary prerequisites and conditions for the development and completion of the creation in the 11th Five-Year Plan period of the second phase of the RSFSR ASPR.

The work of a number of divisions and developers of the Scientific Research Institute of Automated Control Systems relating to the introduction into practice of the most important parts of the ASPR can be evaluated as favorable. The following divisions of the RSFSR Gosplan can be placed among these subdivisions: overall longterm and current plans; territorial planning and allocation of production forces; finances and production cost; land reclamation and environmental protection; balance and distribution of materials, equipment, ferrous and non-ferrous metals and labor; construction industry and subcontracting work; etc. For example, within the framework of the ASPR subsystem "Supply of Materials and Equipment" in 1980 was made possible the computer output of 21 suggestions for the state plan for the economic and social development of the RSFR for 1981 and nine supplements to the corresponding decree of the RSFSR Gosplan, as well as the copying from them of a total amount of more than 4000 pages, which practically represents the entire plan approved for this division. A plan for environmental protection, which includes more than 1100 pages, was calculated for 1981 completely on the computer. More than 50 percent of all planning documents are written on the computer for the RSFSR Gosplan as a whole.

Definite know-how has been gained at the present time in the design and use of ASPR's for local planning agencies. An automated system of planning calculations has been developed most actively in the Moscow and Leningrad city planning commissions and the Chelyabinskaya, Sverdlovskaya and Tomskaya oblast planning commissions.

The ASPR of the Moscow City Planning Commission, for example, includes 35 functional and nine support subsystems. The main result of the first phase of the ASPR has been the creation of a technical base for the system determining the direction and means of improving planning on the basis of mathematical economics calculations and the use of a computer (engineering draft project). Fifty complexes consisting of 148 planning tasks are used in the city planning commission's work.

Work has developed since 1978 on the creation of the Moscow Oblast Planning Commission ASPR. It has been carried out at a high scientific level from the very beginning. All planning problems to be solved in the Moscow Oblast Planning Commission have been analyzed, a list of the most important has been prepared and priority problems among them have been isolated. An engineering assignment for the design of the Moscow Oblast ASPR was developed in 1979 and approved in 1980. The experimental employment of complexes of tasks relating to planning agriculture, capital construction, public services, planning of industry, and labor resources, has been carried out. In all 42 problems are solved.

The structure of the coordination council on the creation of ASPR's and the Moscow Suburbs ASU has been approved for the purpose of improving the organizational level of development. A special branch of the Scientific Research Institute of Automated Control Systems has been organized for the purpose of performing the entire amount of design work.

Much attention is being paid to the creation of ASPR's in Tyumenskaya, Permskaya and other oblasts. Work is being organized for the preparation of design materials for ASPR's in Krasnodarskiy, Krasnoyarskiy and Khabarovskiy krays and Tul'skaya Oblast. Here kray planning commissions and oblast planning commissions are carrying out a number of measures for the purpose of enlisting for this work scientific organizations and computing centers of enterprises and associations available in the territory of the kray or oblast.

However, far from everywhere have planning agencies shown sufficient initiative in the use of opportunities for the creation of ASPR's. For example, in Novosibirskaya and Irkutskaya oblasts, in spite of the presence of resources, work relating to ASPR's has not even been planned hitherto. This approach cannot be acknowledged as proper.

It appears advantageous to expand the introduction of small computers in the working practice of planning agencies. Ten such machines have been used for an extensive period in divisions of the RSFSR Gosplan and Scientific Research Institute of Automated Control Systems. Now already, perhaps, there is sufficient basis to speak of the major role of small computers in planning agencies. Minicomputers are being used for the purpose of solving a wide range of problems which are simple in terms of algorithms and are sufficiently autonomous in terms of information, relating to the processing of economic planning data in 16 divisions of the RSFSR Gosplan. This has made it possible on the one hand to satisfy more completely the demand for processing of planning documents and on the other to solve efficiently a number of problems which have arisen. More than 90 percent of the tasks developed in these divisions are run on minicomputers. For example, in 1980 137 problems out of 150 have been solved with minicomputers in the Division of Territorial Planning and Allocation of Production Forces, and 179 out of 180 in the Division of Finances and Production Cost. Interest in small computers has grown in the divisions of the RSFSR Gosplan in connection with the fact that they are easy to handle and make it possible to bring data processing hardware closer to the work place of a planning worker.

Key Trends in the Development of ASU's in the 11th Five-Year Plan Period

An analysis of data accumulated on the development of ASU's and the results of the introduction of mathematical economics methods and computers have demonstrated that the fundamental trends in the creation of automated systems for controlling the republic's socialist economy have basically been created in the RSFSR and the first results of using them have been obtained. This has made it possible to designate the major ways of developing the ASU-Rossiya in the 11th Five-Year Plan period.

A special place is being set aside for the creation of an automated data processing system (ASOI) for the RSFSR Council of Ministers. A combination of jobs is to be performed: formation of a technical base; the development of the necessary documentation for four sets of tasks ("Control," "State Plan for the Economic and Social Development of the RSFSR and Analysis of Its Fulfillment," "Oblast Executive Committee," and "Information"); and the introduction of these complexes and arrangements for their implementation by means of available hardware components.

New problems have arisen in the area of the development and improvement of the scientific and technical level of interindustrial and industrial ASU's of Union republic and republic ministries and departments of the RSFSR. It is necessary to strengthen the coordination of the separate work relating to their development, introduction and linking with territorial ASU's.

The combination of work indicated represents the overall program for creation of the first phase of the ASU-Rossiya. Reflected in it in concrete form are the work and tasks which will be performed by 220 performers: scientific research and planning organizations of ministries and departments of the RSFSR and USSR and of the USSR Academy of Sciences. Of course their work requires steady coordination on the part of the RSFSR Gosplan.

The procedure and deadlines for development of the RSFSR Gosplan ASPR and those of local planning agencies have been established in keeping with the decree of the CPSU Central Committee and USSR Council of Ministers of 12 July 1979. The following are called for for purposes of speeding the development of ASPR's:

To increase substantially in the second phase the number of economic planning problems which can be implemented by means of computers; to unite them into complexes making it possible to produce directly on a computer a plan draft and planning documents to be approved.

To begin the development of a central complex of economic planning problems which is to make possible the multivariant working out of key indicators for the economic and social development of the RSFSR and solution of the general problem of balance of timing and proportions in the national economy.

To complete the development of all necessary support facilities essentially in 1982-1983 and of functional susbsystems in 1984-1985.

To form the basis of an ASPR and data bank unified automated data bank for complexes of tasks in the second phase of the ASPR.

To make possible interaction between the RSFSR Gosplan ASPR and the USSR Gosplan ASPR, the ASU's of ministries and departments of the USSR and RSFSR, and the ASPR's of the state planning commissions of autonomous republics and planning commissions of krays and oblasts with the preparation of drafts of plans for economic and social development.

The organization of the obtainment of data from ministries and departments on machine media.

Conversion of the technical base to unified-series computers with the necessary facilities and with the appropriate software.

In creating territorial ASU's there is also the problem of going from individual experiments on their development to the creation in the first phase of their central component--the ASPR. It seems that at the new stage of the development of territorial entities of an ASPR the purpose of this development must be the obtainment of sections of drafts of plans and of planning documents for approval from the computer, as well as the output of various information on the basis of planning and statistical data. Then it is necessary to increase the proportion of analytical calculations making it possible to achieve variance and the optimization of plans.

A fundamental feature of the second phase of an ASPR is the unification of planning problems to be solved on the computer into complexes, and then into a system of planning calculations. No doubt this will consist primarily of work relating to the creation and mastery of standard and general system facilities and to the introduction of mathematical economics models of forecasting and optimization, which must become one of the key tools for improving the quality of plans.

An important trend in formation of the second phase is the development in entities of work relating to the creation of the elements of general system unifying RASU [republic automated control system] facilities, in particular, of automated data banks, collective-use computing centers and a data transmission system which will serve as the basis for solving the problem of compatibility of components of the ASU-Rossiya.

And finally the next trend is the beginning of systematic work relating to the implementation of interaction among entities. In this connection plans have been made to carry out an experiment on interaction between the RSFSR Gosplan ASPR and the petroleum products ASU of the RSFSR State Committee for Petroleum Products, the ASU's of the RSFSR Ministry of Motor Vehicle Transportation, Ministry of Light Industry, Ministry of the Textile Industry, Ministry of Higher Educational Institutions and Ministry of Construction Materials, and the ASPR's of the planning commissions of Moscow, Tomskaya, Sverdlovskaya and Chelyabinskaya oblasts.

First-level importance is being attached to the development of work on the interaction of the RSFSR Gosplan ASPR and those of local planning agencies with the automated control systems of ministries, departments and local soviets. This will be achieved by coordinating the structure of planning problems at the all-Union and republic planning levels and by using unified methods and means of solving them and coordinating the work of ministries and departments.

As the result of work along these main lines, in the 11th Five-Year Plan period the creation of the first phase of the ASU-Rossiya will be completed in the form of a system complex including the following:

The first phase of the head entity of the ASOI system of the RSFSR Council of Ministers.

The second phase of the automated system of planning calculations of the RSFSR Gosplan, functioning in the mode of interaction with entities of the ASU-Rossiya.

Interindustrial, industrial and territorial entities of the first phase of the ASU-Rossiya, functioning on the basis of unified system, information and software facilities.

These trends in the development and utilization of computer technology require the development of fundamentally new forms of using computers and other hardware components. Collective-use computing centers are the most progressive among these forms. The first five VTsKP's were put into experimental operation in our country in 1979, including in Tula, Tomsk and Leningrad in the RSFSR. Even their brief operation has given favorable results.

The demand of the CPSU Central Committee regarding the development of collective-use computing centers was again confirmed in the "Main Guidelines for the Economic and Social Development of the USSR for 1981-1985 and for the Period to 1990." The RSFSR Gosplan has been given the job of developing suggestions regarding the inclusion in the draft of the five-year plan for 1981-1985 of assignments for the accelerated development of these computing centers. More than 800 individual computing centers, many of which are rather large, were counted in the republic at the beginning of 1981. Thus, we have at our disposal a significant base for the formation of VTsKP's.

In connection with the growth of the computer inventory other problems have also arisen--of servicing computers and of outfitting them with peripheral equipment and of training personnel. It seems to us that it should be on the planning agenda to solve the question of improving the servicing of existing computing centers of enterprises, associations, ministries and departments. The number of computers is growing steadily and they have an ever greater capacity and are being included to an ever greater extent in technological processes of production, control, research work and the educational process. The failure and the untimely repair of computers does considerable damage to the national economy and reduces the effectiveness of automated systems. The "Soyuzevmkomplekt" organization created for the purpose of the centralized servicing of computers in the USSR Ministry of Instrument Making, Automation Equipment and Control Systems is still not up to the tasks confronting it.

The servicing of computers acquired abroad has practically not been organized. All users of computers independently solve problems in servicing them. It would be proper to create a special service for this purpose. Obviously the final word here must be spoken by the USSR Gossnab and USSR Ministry of Instrument Making, Automation Equipment and Control Systems.

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HARDWARE AND SOFTWARE COMPLEX FOR CLASSIFYING NOISE SIGNALS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 (manuscript received 16 Jul 79, after revision 17 Nov 80) pp 124-127

[Paper by I.K. Alkin, V.V. Geppener and V.I. Timokhin]

[Text] One of the urgent problems at the present time is the realization of the hardware to solve the problems of the recognition of signals of various kinds.

It is frequently necessary to use large high performance computers to assure efficient functioning of a recognition system. However, in a number of cases, it is necessary to take into account the actual operational conditions which do not permit the use of large computers, in addition to the stipulation that high reliability be obtained. Included here is the necessity of placing the signal classifier in limited volumes and the requirement for sparing the consumption of electrical power as well as transportability.

Where the limitations enumerated above exist, it becomes necessary to design classifiers based on specialized computers (SVU) with a limited computer capacity. In this case, considering the limited computational capabilities of specialized computers, it is expedient to consider the joint utilization of a high performance computer in the teaching stage of the classification systems (the generation of the parameters of the decision making rules) and a specialized computer in the recognition stage (utilizing the parameters obtained in the teaching).

A hardware and software complex (APK) is described here for the real time classification of noise signals, where the complex is realized using the computers considered above. Readouts of the values of the spectral power density of a random process in definite frequency bands are used as the classification criteria for a signal.

A functional schematic showing the interaction of all of the APK components is given in Figure 1. The hardware of the complex is realized based on the series produced 15VSM-5 specialized computer, standard peripherals (a 32 K byte peripheral memory, punched tape input, trunk expander and a "Konsul-260" typewriter) as well as equipment which was additionally developed (a spectrum analyzer, multichannel analog-digital converter, memory, controller, a unit for displaying the power spectrum estimates, a device for printing the spectrum out on punched tapes and an interface).

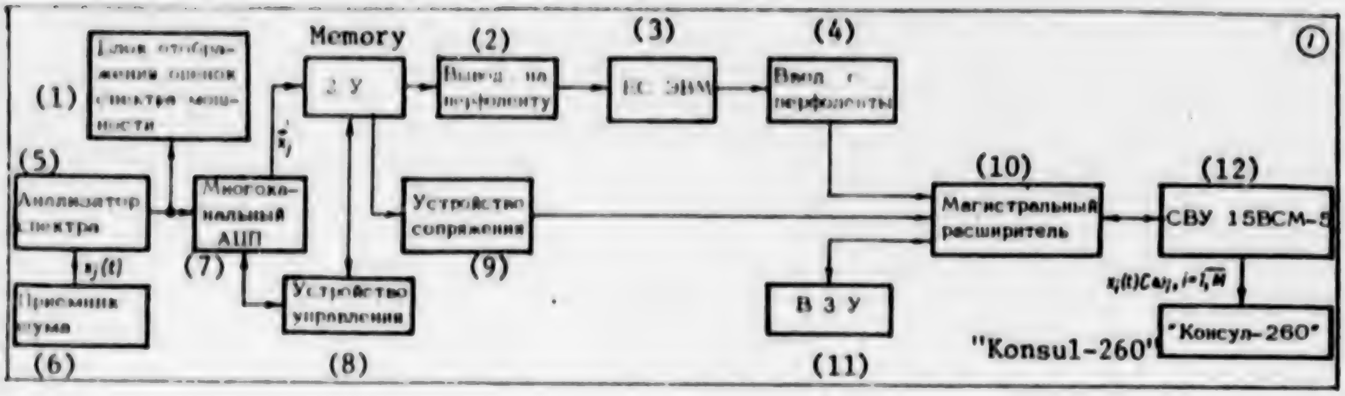

Figure 1.

Key:
1. Display for the estimates of the power spectrum;
2. Punched tape output;
3. Unified system computer;
4. Input from punched tape;
5. Spectrum analyzer;
6. Noise receiver;
7. Multichannel analog-digital converter;
8. Control unit;
9. Interface;
10. Trunk expander;
11. Peripheral memory;
12. 15VSM-5 specialized digital computer.

The major components of the APK software are a package of programs for unified system computers, intended for the construction of the decision making rules (the teaching) and a set of programs for the 15VSM-5 specialized computer.

We shall analyze the functioning of the hardware of the complex. The spectrum analyzer takes the form of a set of 22 measurement channels, which contain quarter-octave active bandpass filters. The channels are constructed in a traditional circuit configuration: bandpass filter--squarer--integrator.

The analog signals obtained at the outputs of the measurement channels are converted to a binary eight-bit code by means of the multichannel A/D converter, which makes it possible to execute a conversion using all 22 channels simultaneously. The basis for the operation of the A/D converter is the principle of pulse time coding. The A/D converter includes: a ramp voltage generator, 22 comparators, a square wave pulse generator and 22 eight-bit binary counters (a memory). The counters carry out the conversion of the unit code to a binary one and store all 22 codes for the processing time.

The interface performs the following functions: it converts the binary eight-bit code of the A/D converter to the specialized computer code, carries out the byte by byte input of the converted code into the 15VSM-5 and also provides for asynchronous operation of the 15VSM-5 with the multichannel A/D converter.

The specialized computer is intended to perform as a unit for making decisions as to whether the input signal belongs to one of the classes under consideration. The choice of the 15 VSM-5 specialized computer from among devices of the same type is explained by the existence of standard interfaces which have been developed, the capability of directly building up the memory with ready made units and the simplicity in servicing and low price.

The preprocessor processing of the signals being classified is essential because of the relatively slow speed of the 15VSM-5 specialized computer (the time for an addition operation is 3 msec), something which does not allow for the realization of a system operating in real time in the case where spectral analysis is also assigned to the specialized computer.

In the package of programs which has been developed, the teaching process provides for the execution of a number of steps, specifically:

--The choice of the system of existing indicators for classification;

--Automatic grouping of the objects being studied;

--Estimation of the statistical parameters;

--Computation of the coefficients of the set of resolving functions (RF);

--Curtailing the set of these functions;

--Constructing the decision making rules.

In all teaching steps, it is presupposed that the distributions of the instantaneous values of the estimates of the spectrum of the signals being studied are approximated either by normal multidimensional distributions, or by a set of normal distributions. It is permitted in this case for all classes and subclasses to differ from each other not only in the mathematical mean values, but also in the covariation matrices.

Chosen as the set of significant indicators are sets of indicators which maximize the multiple correlation factor [1]. The calculations of the coefficients of the set of resolving functions are made for the condition of pair by pair division, and the Anderson-Bahadur procedure is realized [2]. Structural matrices which characterize the mutual position of the groups being classified and a full set of pair by pair divided functions are used to solve the problem of searching out the minimal set of resolving functions, which realize the decision making rule for multiclass classification [3].

The teaching process is accomplished on a unified system computer by means of the developed package of applied programs, the basic function of which is the construction of the decision making rules for multiclass classifications for the device based on the 15VSM-5. Also included in the package of programs are programs which model the classification steps (to check the resolving rule which is obtained), and a number of service routines. The service routines are intended for the input of the raw statistical data from the punched tape and then writing it onto magnetic tape or a disk, as well as for punched tape output of the resolving rule in the 15VSM-5 codes.

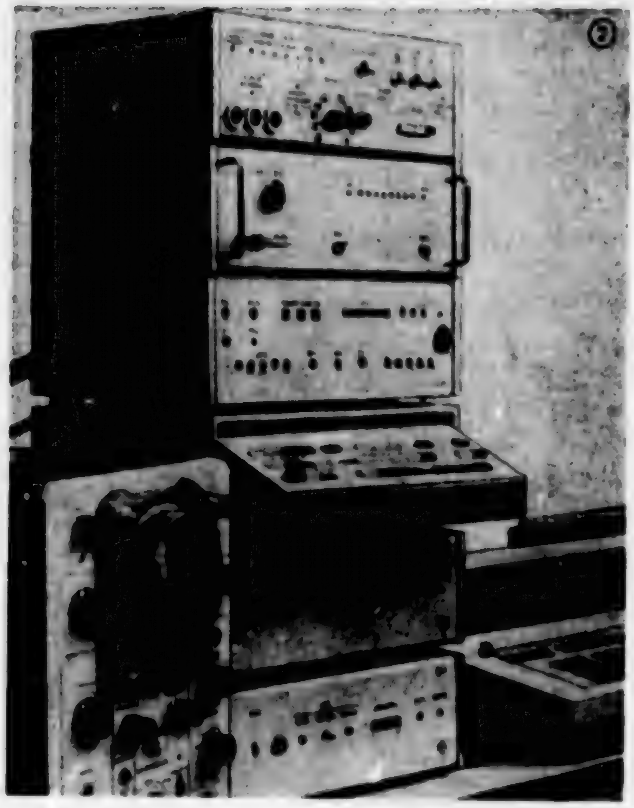

Figure 2.

Each teaching step is realized by the appropriate subroutine or by a set of subroutines, the function of which is indicated below:

--The selection of the significant criteria;

--Automatic grouping;

--The calculation of the estimates of the mean value and the covariation matrices in a teaching mode with an instructor;

--The estimation of the mean values and the covariation matrices based on the results of automatic grouping;

--The calculation of the coefficients of the set of resolving functions;

--The calculation of the set of coefficients of noise immune resolving functions [4];

--The construction of the characteristic matrices;

--Curtailing the set of resolving functions in accordance with the characteristic matrices;

--The construction of the decision making rule;

--The construction of the decision making rule using the characteristic matrices;

--The generation of the set of abbreviated resolving logic functions;

--Modeling recognition based the decision making rule;

--Modeling recognition using the resolving logic functions;

--Recognition utilizing the criterion of minimal spacing.

Alll of the subroutines are combined in a main program, which has an overline structure. The functions of the main program are the raw data input and calling up the corresponding subroutines, depending on the problems being solved. The query sequence (callup) depends on the parameters specified with the initial data.

To support the operation of the specialized computer, the following have been developed as the classifier:

--A program for multiclass classification based on the decision making rule obtained on the unified system computer;

--A program for the construction of reference standards for two classes (teaching with an instructor) with the ranking of the indicators in terms of significance for identification. The reference standards take the form of the averaged spectrum of the signal being analyzed. The value of the indicators is determined from the absolute value of the resolving function coefficients [5]. The set of significant indicators is determined in a dialog mode. During the classification, a minimum spacing algorithm is realized [6];

--A program for the construction of a set of reference standards which characterize the signals being analyzed. The given program makes it possible to realize a multiclass classifier, based not only on linear, but also on piecewise-linear resolving functions [6].

The two latter programs make it possible to realize the teaching directly on the 15VSM-5, eliminating the necessity of utilizing a unified system computer.

All of the functionally complete program units, which are used in several programs or are used repeatedly in one of them, are formatted in subroutines, the set of which reduces the labor intensity of the work involved with the creation of large program systems for the 15 VSM-5.

Segmentation of the large volume programs is provided by a cassette magnetic tape store built into the 15VSM-5 as well as by a peripheral memory.

During the teaching, the input signal being analyzed is fed from the noise receiver to the spectrum analyzer, at the output of each measurement channel of which we obtain an analog quantity, which represents an estimate of the power spectrum in the given band of frequencies. The multichannel A/D converter makes it possible to register the values at a definite point in time in all of the measurement channels simultaneously, with the subsequent transmission of all of the codes to the memory; the memory contents are fed out on punched tape. Thus, an instantaneous estimate of the power spectrum of the signal being studied is fed out on punched tape, where this estimate is the raw statistical material for processing in the unified system computer. As a result of carrying out the teaching step, we obtain a set of resolving function coefficients, the numbers of the indicators (channels) which are significant for the classification and a decision making rule, i.e., the determination of the sequence for the query of the set of resolving functions. All of this is fed out on punched tape in 15VSM-5 codes. The setting up of the specialized computer for the subsequent classification is accomplished by feeding in the punched tape which contains the resolving coefficients, the numbers of the channels and the decision making rule in the peripheral memory of the 15VSM-5.

When running the classification procedure for real signals, the estimate of the signal power spectrum is fed directly from the spectrum analyzer and the A/D converter through the interface to the specialized computer. An external view of the hardware of the complex is shown in Figure 2.

To check the operability and the operational quality of the proposed hardware and software complex, experiments were performed on real signals. Three types of engine operating noise (proper operation, timing advanced, knocking valves) were treated as the classification subjects. The length of the realizations for each class was defined as 15 minute intervals. Chosen in each realization were 5 minute segments, from which the instantaneous estimates of the power spectrum of each type of noise were fed out on punched tape. In all, about 1,000 instantaneous estimates of the power spectrum were obtained for each type, which were fed into the all-purpose computer. Approximately 300 instantaneous estimates took part in the teaching of each type of noise.

The experiments demonstrated that the correct recognition of the classifier in the realization segments, participating in the teaching, occurred in 99% of the cases, and in the realization segments which did not participate in the teaching, in 95% of the cases. In this case, the decision making time did not exceed 2 seconds.

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HYDROPHYSICAL INSTRUMENTATION AND COMPUTER COMPLEX

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 (manuscript received 18 Apr 80) pp 100-106

[Paper by Ye.G. Nechesin, A.V. Nikitin, A.N. Paramonov, Ye.I. Timofeyev and Yu.I. Shapovalov]

[Text] The experimental study of the ocean at the present time is characterized by a systems approach: topical goal oriented expeditions of scientific research vessels are organized, comprehensive studies of physical processes and phenomena on various scales are carried out and their interaction and development is being studied. When performing a controlled experiment in the ocean, the information should be processed and the results analyzed directly during the observation process in real time.

Such studies cannot be carried out without automating the experiment, primarily using computer equipment. For this purpose, automated information systems are being created on scientific research vessels, where these systems have a hierarchical multiply connected structure [1]. Instrumentation computer complexes are being developed as one of the components of this structure, which not only perform the conversion and visualization of the quantities being measured, but also provide for automation of the collection and primary processing of the measurement data, its storage for the creation of a data bank as well as the output of the results on a display. The most effective approach to design such complexes around specialized mini and microcomputers.

An instrumentation computer complex to study small scale oceanic turbulence under local hydrological conditions has been designed and developed at the Maritime Hydrophysical Institute of the Ukrainian SSR Academy of Sciences. The following are determined as the informational characteristics of small scale turbulence: estimates of the spectral power density of the pulsations in the longitudinal component of the current velocity at fixed wave numbers and the parameters of a mathematical model of the one-dimensional spatial spectrum of the turbulence. The temperature, salinity, sea water density and the vertical density gradient, which govern local hydrological conditions, are measured synchronously with the determination of the spectral characteristics. Moreover, the immersion depth of the instrument and the average velocity of the incident flow are measured.

The progressive concept of buswise organization and modularity of the functional assemblies has been taken as the basis for the design of the instrumentation computer complex; this concept provides for the capability of adding-on and optimizing at each stage of development. A block diagram of the complex is shown in Figure 1, and it incorporates the following components:

--Two sets of specific electrical conductivity meters, sea water temperature and hydrostatic pressure meters: the IPP1 and IPP2 of the "Istok-5" type [2];

--An electromagnetic type meter for the pulsations in the longitudinal component of the current velocity: EMKA [3] and a set of analog bandpass filters-resonators for a spectrum analyzer;

--A hydrodynamic type meter for the average incidence flow velocity: the ISP;

--An operator's console of the complex for specifying the initial conditions, selecting the operational program for the complex and status display for the hardware;

--A subscriber address decoder;

--A priority and code generation unit for nonprogrammable instructions;

--A specialized digital computer: the SVM;

--A miniature printer with a controller;

--A tape puncher with a controller;

--Analog recorders;

--The communications trunk.

The complex consists of the submersible and on-board equipment sets, which are connected by a cable. The maximum cable length is governed by the maximum submersion depth of the instrument and amounts to 500 meters. All of the meters are incorporated in the submersible unit.

In structural design terms, it is made in the form of a steel frame, on which the hydrological parameter meters are mounted at the one meter level relative to the vertical, while the meters for the pulsations in the flow velocity and the average velocity of the incident flow are positioned between them. The equipment is oriented relative to the flow by means of two tail stabilizers.

Each hydrological parameter meter performs the measurement, conversion to digital form and transmission of the four values of the specific electrical conductivity, sea water temperature, hydrostatic pressure and the regulated control voltage during one measurement cycle, which is equal to 0.25 or 1 sec. The conversion to digital form is accomplished by means of high speed 14-bit converters. Two check bits are generated in the monitor unit. The data is transmitted via a

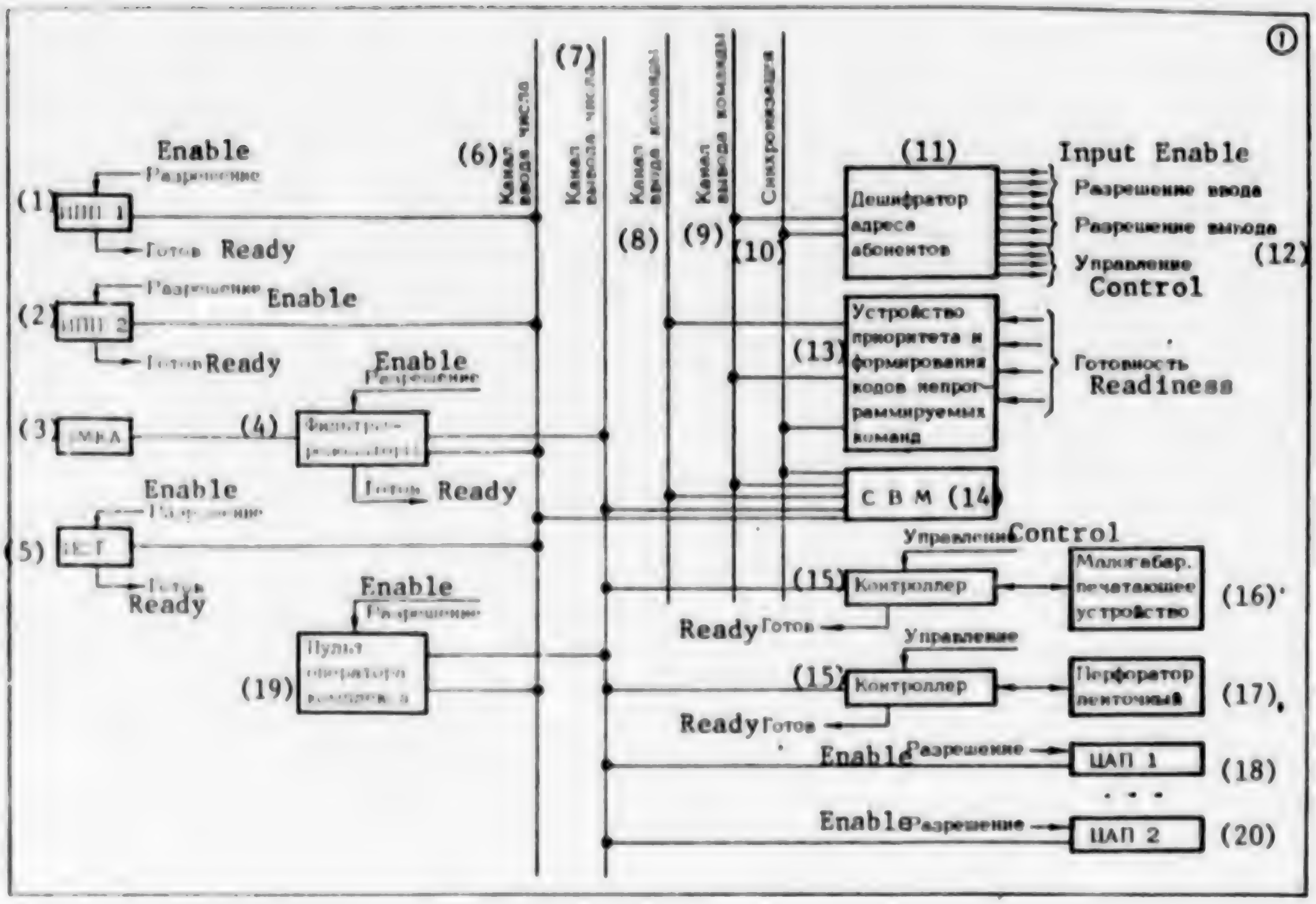

Figure 1. Structure of the hydrophysical instrumentation computer complex.

Key:
1. IPP1 [set 1 of meters for the specific electrical conductivity, sea water temperature and hydrostatic pressure];
2. IPP2 [meter set 2];
3. EMKA [electromagnetic type meter for the pulstations in the longitudinal component of the current velocity];
4. Resonator-filters;
5. IST [hydrodynamic type average incident flow velocity meter];
6. Number input channel;
7. Number output channel;
8. Instruction input channel;
9. Instruction output channel;
10. Synchronization;
11. Subscriber address decoder;
12. Output enable;
13. Priority and nonprogrammable instruction code generation unit;

[Key to Figure 1, continued]:

14. SVM [specialized digital computer];
15. Controller;
16. Miniature printer;
17. Tape perforator;
18. Digital/analog converter 1;
19. Operator's console for the complex;
20. Digital-analog converter 2.

communications cable to the on-board unit in a series code. The maximum data input rate from each hydrological parameter meters amounts to 256 bit/sec.

The spectral analysis of the signal from the meter for the pulsations in the longitudinal component of the current velocity is accomplished in analog form by means of parallel filtering using bandpass filter-resonators [4]. The transition is made from the timewise characteristics to the spatial ones while taking into account the "frozone turbulence" hypothesis. The constancy of the wave numbers at which the spectral components of the current velocity pulsations are determined is achieved by automatically tuning the resonant frequencies of the bandpass filters in accordance with the measurement data on the average velocity of the incident flow. The signals from the outputs of the filters are converted to digital form by means of ten-place analog to digital converters. A check bit (modulo 2 addition) is generated in the monitor unit. Depending on the operational mode of the complex, the 11-digit codes are fed from the output of each filter to the trunk at a frequency of 512 or 2,048 Hz. Nine-bit information codes (eight information bits and one check bit) are fed from the meter for the average flow velocity at a frequency of one Hz.

Each meter has an interface output, which converts the format of the meter data to the standard format of the complex and organizes the reception of the exchange enable signal and the generation of the exchange readiness signal. A 24-bit supplemental modified code with two check bits, with which the specialized digital computer operates, has been adopted in the trunk as the standard format.

The specialized digital computer interface was taken as the basis in the construction of the specialized instrumentation interface. The interface trunk consists of 128 buses, grouped according to functional operations into four channels, and eight synchronization and control buses. The designation and composition of the channels are as follows:

--The numerical data output channel, incorporating 24 output buses of a parallel 24 or 12 bit code, two check bit buses and four operations buses (two for a programmable and two for a nonprogrammable output);

--An instruction data output channel, including 16 permanent storage address code output buses, 16 main memory address code output buses and 7 operation code output buses;

--A numerical data input channel, including 24 input buses for a 24 or a 12-bit code, two check bit buses, two operations buses (for a programmable and nonprogrammable input) as well as one bus for the SBOY VVODA [DUMP INPUT] signal;

--An instruction data input channel, incorporating 24 parallel code input buses for nonprogrammable instructions, two check bit buses, one operation bus for a nonprogrammable instruction, two buses for reciept signals for the reception of the nonprogrammable instruction codes and one bus for signals on the dumping of a nonprogrammable instruction.

Moreover, the exchange is synchronized via six buses and signals concerning the proper operation or failure of the digital computer are fed out via two separate buses. The interface trunk allows for a maximum exchange rate of 150,000 26-bit words per second.

The fastest method of data exchange between the peripherals the main memory by means of direct access channels has been realized in the complex.

Because of the presence of an instruction output channel, a definite magnetic core storage location is signed to each subscriber in the organization of the data exchange in the complex, i.e., a magnetic core storage location address defines a subscriber address. All of the subscribers tied into the interface trunk are broken down into two groups:

--Subscribers ready for exchange at any point in time. These include the registers of the complex operator's console and the digital-analog converters of the analog recorders;

--Subscribers with a short data storage time, the exchange with which is realized to the extent that they are ready. These include the hydrological meters, the meters for the pulsations in the current velocities and the average flow velocity as well as the digital recorder.

Exchange is carried out with the first group of subscribers at the initiative of the specialized digital computer in accordance with programs by means of input-output instruction at specified points in time in the measurement cycle, which are determined by the dispatcher program. With the arrival of an input-output instruction, the specialized digital computer writes its address portion into the subscriber address decoder via the instruction output channel. The selected subscriber is prepared for the exchange by the gating signal from the output of the INPUT-OUTPUT ENABLE decoder. The data is transmitted between the subscriber and the core storage location, the address of which is likewise specified by the address portion of the instruction, via the input-output channels for the numerical data over one operational cycle of the specialized digital computer.

Data exchange is set up asynchronously with the second group of subscribers using readiness signals by means of a nonprogrammable interrupt and stop instruction.

A meter which is ready to feed out data generates the GOTOVNOST' [READINESS] signal, which is picked up by the priority and nonprogrammable instruction codes generating unit. When authorization is present from the priority unit, the address portion, the input operation code and the NK nonprogrammable instruction sign are generated, which are fed out into the instruction input channel. The address portion of the instruction is picked up by the subscriber address decoder.

The RAZRESHENIYE VVODA [INPUT ENABLE] signal which is generated is fed to the meter which is ready for exchange and switches its output to the numerical data input channel buses. In accordance with NK indicator, the specialized digital computer ceases the execution of the current program and carries out the nonprogrammable input instruction which has arrived via the instruction input channel. The numerical input data from the meter is written into the magnetic core storage location via the numerical data input channel, where the address of this location is indicated in the code of the nonprogrammable instruction. The execution of the indicated instruction does not change the current data in the specialized digital computer registers, and for this reason, such a query is serviced in any operational cycle of the computer. The main program is stopped following the execution of the machine cycle, during which the stoppage query has arrived. The access time for the execution of nonprogrammable input instructions does not exceed 8.5 microseconds.

A combined method is used for exchange with the digital recorders by means of programmable and nonprogrammable instructions. The data is fed out to the digital recorders at the initiative of the specialized digital computer, to the extent that a data file is ready, by means of module for the organization of the operation of the dispatcher program output units. The periodicity for the actuation of these programs is specified from the complex operator's console and is monitored by means of indicators by the dispatcher program. In this case, the specialized digital computer exchanges the addresses of subscriber with the decoder via the instruction output channel by means of the output instruction code, the address portion of which is decoded as a controlling signal to turn on the recorder. Following the run-up of the recorder motor, the READY signal is fed out, which arrives at the priority and nonprogrammable instruction code generation unit.

Taking the priority of the recorder into account with respect to other subscribers, the nonprogrammable instruction code is generated in the unit for the unconditional transfer of control, which is fed via the instruction input channel to the specialized digital computer. In this case, the current program is interrupted and the specialized digital computer switches over to the execution of the program for exchange with the recorder. The maximum access time for the execution of a nonprogrammable interrupt instruction does not exceed 93 microseconds.

The requisite memory storage of the contents of the specialized digital computer registers and their restoration when returning to the main program are realized by the interrupting program.

The quantity of data needed to record one line of symbols is fed out in accordance with the exchange program. The codes from the locations of the magnetic core storage are rewritten via the numerical output channel into the recorder buffer using the same algorithm as for the first group of subscribers.

With this, the process of servicing the incoming query is completed, and the specialized digital computer switches over to operation in accordance with the main program. Subsequently, all of the functions for the output of a numerical data line are taken over by the recorder controller. Subsequent accesses to the exchange program are made asynchronously following the recording of a symbol line in accordance with the readiness signal from the unit and taking the priority into account. Thus, the maximum independence is achieved between the computing process and the data output process.

Having completed the output of an entire data file, the dispatcher program, in accordance with the indicator for the end of the output data, turns the recorder off through the address decoder.

The software system which has been developed also has a modular structure. The software of the complex includes the operating system, the routines for calculating the spectral characteristics and hydrological parameters, diagnostic test routines for checking the operability of the special digital computer and the input-output channels, a functional monitoring program, programs for data output to analog and digital recorders as well as subroutines for calculating standard functions. The programming software structure of the complex is shown in Figure 2.

The operating system is intended for the execution of the common algorithm for the automated functioning of the complex and is oriented towards real time data processing. The basis for the operating system is the dispatcher program, which is located in the permanent storage of the specialized digital computer and occupies 1,152 memory locations. A specific feature of the computer which is used in the complex is the fact that all of the program modules occupy fixed portions of the permanent storage. The programs for processing and data output to the recorders are accessed in accordance with program indicators, and in accordance with external interrupt from the timer and from the digital recorders.

The basic timing unit is the time for one measurement cycle of the hydrological parameters, which, depending on the operational mode, is either 0.25 or 1.0 sec. Upon completing a measurement cycle, the timer, which is included in the complement of the unit for generating the nonprogrammable instruction codes, generates a nonprogrammable unconditional control transfer instruction. The current program is interrupted and a batch of processing routines is started. They are executed sequentially one after the other. During the time for running the date rewrite program, the dispatcher blocks the generation of a nonprogrammable instruction. Thereafter, the block is removed, data input from the meters is enabled as well as the output of the results to the digital recorders.

The dispatcher programs synchronizes the operation of the units of the complex in the data averaging and accumulation cycle. To account for the nonsteady-state nature of oceanic turbulence, a provision is made for averaging over several time intervals with durations of 10, 20, 40 and 80 seconds or over spatial intervals with lengths of 20, 40, 80 and 160 meters. The conditions of the averaging are specified by the operator. The operator is coupled to the specialized digital computer by means of multiposition and toggle switches on the control console of the complex.

The operability of the complex is monitored prior to starting and upon completing an experiment using the functional monitoring program. In this case, all of the hardware and channels of the complex are encompassed by the monitoring, with the exception of the sensors. The results are printed out on a digital printer. The operational monitoring of the instrumentation channel, the numerical data input-output channels and the magnetic core storage channel is accomplished continuously during each measurement cycle using check codes fed in from the hydrological parameter meters. When the incoming codes match constants which were determined when calibrating the meters, normal operation signals for the hydrological parameter meters are generated with the participation of the dispatcher program. The passage of these signals is indicated on the operator's console. The monitoring of all of the data incoming to the specialized digital computer via the instruction and numerical input channels is accomplished using check bits.

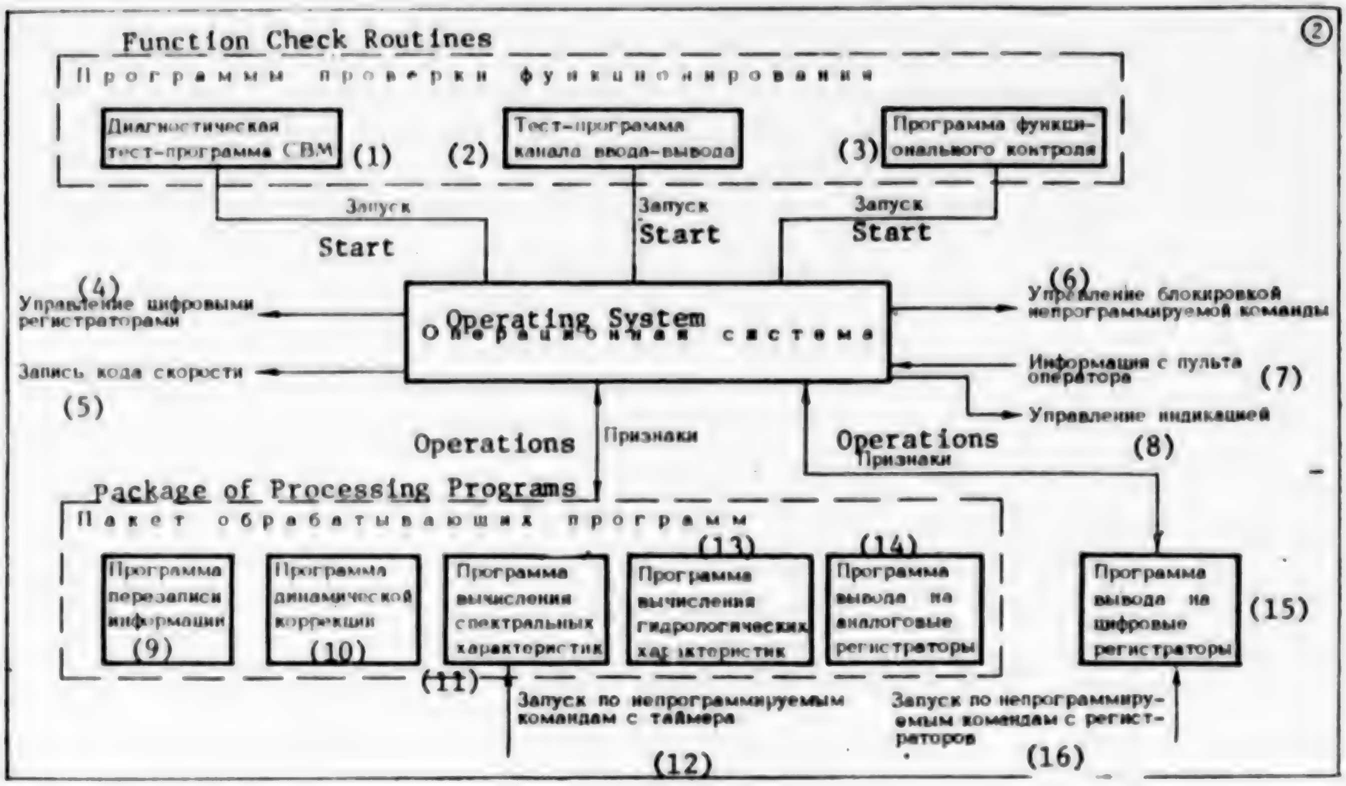
②
Function Check Routines
Программы проверки функционирования
Диагностическая тест-программа СВМ
(1)
(2)
Тест-программа канала ввода-вывода
(3)
Программа функционального контроля
Запуск
Start
Запуск
Start
Запуск
Start
(4)
Управление цифровыми регистраторами
Operating System
Операционная система
(6)
Управление блокировкой непрограммируемой команды
Запись кода скорости
(5)
Информация с пульта оператора
(7)
Управление индикацией
(8)
Operations
Признаки
Operations
Признаки
Package of Processing Programs
Пакет обрабатывающих программ
Программа перезаписи информации
(9)
Программа динамической коррекции
(10)
Программа вычисления спектральных характеристик
(11)
(13)
Программа вычисления гидрологических характеристик
(14)
Программа вывода на аналоговые регистраторы
Программа вывода на цифровые регистраторы
(15)
Запуск по непрограммируемым командам с таймера
(12)
Запуск по непрограммируемым командам с регистраторов
(16)

Figure 2. The software structure.

Key:
1. Specialized digital computer diagnostic test routine;
2. Input-output channel test routine;
3. Functional monitoring routine;
4. Control of the digital recorders;
5. Rate code write;
6. Control of the blocking of a nonprogrammable instruction;
7. Information from the operator's console;
8. Readout control;
9. Data rewrite program;
10. Dynamic correction program;
11. Program for computing the spectral characteristics;

[Key to Figure 2, continued]:

12. Starting using nonprogrammable instructions from the timer;
13. The program for calculating hydrological characteristics;
14. Program for the output to the analog recorders;
15. Program for output to the digital recorders;
16. Starting using nonprogrammable instructions from the recorders.

The date from the meters is processed in real time. A polynomial approximation of the graduated characteristics of the meters is used to calculate the physical values of the hydrological parameters being measured as well as the average incident flow velocity.

The dynamic characteristics of the measurement channel are corrected by means of digital second order recursive filters. The difference equations, which describe the operation of the filters, have the following form when written in canonical form:

$$\begin{aligned} y(nT_s) &= 4b_0 x(nT_s) + 4y_1(nT_s - T_s), \\ y_1(nT_s) &= b_1 x(nT_s) + 0{,}5a_1 y(nT_s) + y_2(nT_s - T_s), \\ y_2(nT_s) &= b_2 x(nT_s) + 0{,}5a_2 y(nT_s), \end{aligned}$$

where $x(nT_s)$ is the discrete representation of the signal at the filter input; $Y(nT_s)$ is the discrete representation of the signal at the filter output; a_i and b_i are the values of the coefficients which are chosen as a function of the dynamic characteristics of the measurement channels.

The indirectly measured parameters are calculated from the results of direct measurements of the temperature, specific electrical conductivity of the sea water and the hydrostatic pressure: the immersion depth of the instrument, salinity, the conditional sea water density and the vertical density gradient.

The polynomials derived in [5, 6] were used to calculate the salinity S and the conditional sea water density at atmospheric pressure σ_t. These polynomials have the form:

$$y = \sum_{i=0}^{4} a_i \cdot t^i + \varkappa_{St0} \sum_{j=0}^{3} b_j \cdot t^j + \varkappa_{St0}^2 \sum_{k=0}^{1} c_k \cdot t^k \qquad (1)$$

and depending on the values of the coefficients a_i, b_j and c_k also make it possible to calculate the salinity and the conditional density. In expression (1), $\varkappa_{St0}$ is the value of the specific electrical conductivity at atmospheric pressure, which is determined from direct measurements of $\varkappa_{StP}$ using the formula given in [5].

The conditional sea water density at a definite depth σ_{StP} is computed from the formula [7]:

$$\sigma_{StP} = \sigma_t \sum_{i=0}^{2} a_i \cdot P^i + P \sum_{j=0}^{2} b_j t^j + \sigma_t \cdot P \cdot t \sum_{k=0}^{1} c_k \cdot t^k.$$

Интервал осреднения, м (1)	Относительная среднеквадратическая погрешность ε (в %) при различных значениях волновых чисел k (в м$^{-1}$) (2)			
	1,5	3	15	30
10	35,9	25,9	13,2	10,5
20	25,9	19.0	10.5	8,9
40	19,0	14.3	8,9	7,9
80	14.3	11,4	7,9	7,4
100	11,4	9,5	7,4	7,1

Key: 1. Averaging interval, meters;
2. Relative mean square error ε (in percent) for various wave number values k (in m^{-1}).

The algorithms used for calculating the hydrological parameters were specially developed taking into account the application of micro and minicomputers. Their realization requires minimal machine time expenditures and minimal memory loading. At the same time, they provide for the requisite computational precision.

Estimates of the spectral power density of the pulsations in the longitudinal current velocity component are determined using the algorithm given in [4]:

$$E(k_i) = \frac{1}{K_{\text{об}}^2 \alpha_{\text{эф}} k_i N_0} \cdot \sum_{n=0}^{N_0-1} Y_i^2(nT_k).$$

where $Y_i(nT_k)$ is the discrete representation of the signal at the output of the i-th filter; T_k is the digitization period of the signals from the filter outputs; K_{ob} is the general transmission gain of the measurement channel for the current velocity pulsations; N_0 is the number of summings over the averaging time (T_0 = = 10, 20, 40 and 80 sec) or in the case of averaging on spatial scales (L_0 = 20, 40, 80 and 160 m); k_i is the wave number for which the estimate is determined.

The spectral parameters are calculated assuming a very simple one-dimensional model for the spatial energy spectrum of the turbulence $E(k) = C \cdot k^{-\alpha}$. In the case of a piecewise-linear approximation of this function, the parameter α_i is determined from values of the logarithms of the estimates for two adjacent wave numbers k_i and k_{i+1}:

$$\alpha_i = \frac{\lg E(k_i) - \lg E(k_{i+1})}{\lg k_{i+1} - \lg k_i}.$$

The relative mean square error in the determination of the estimates of the spectral power density of the pulsations in the longitudinal component of the current velocity for wave numbers k in the case of various spatial averaging intervals is given in the table.

The existing prototype of the complex has undergone universal laboratory and sea trials, which have confirmed the stability of the metrological characteristics and the operational reliability. Studies of turbulence characteristics under local hydrological conditions in the tropical Atlantic and in a test area in the Black Sea were carried out using the complex.

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PRINCIPLE DIRECTIONS OF AUTOMATED PLAN CALCULATION SYSTEM DEVELOPMENT WORK IN 11TH FIVE-YEAR PLAN

Moscow EKONOMIKA I MATEMATICHESKIYE METODY in Russian Vol 17, No 3, May-Jun 81 (manuscript received 12 Aug 80) pp 429-439

[Article by V. B. Bezrukov and O. M. Yun', Moscow]

[Text] Assuming special importance under the conditions of developed socialism are the problems of further elaboration of the theory and practice of planning. The decisions of the 24th, 25th and 26th CPSU congresses and the decrees of the party central committee plenums outlined a broad program to improve the plan management of the socialist economy which embraces all aspects of this multifaceted problem.

A practical direction in implementing this program is the widespread introduction of economic and mathematical methods and computers into the technology of plan work through the development of the automated system for plan calculations (ASPR) in the USSR Gosplan, the union republic gosplans and local plan agencies.

The first phase of the ASPR was accepted in 1977-1978; it is the system part, which has been placed into service, that includes the aggregate of the plan problems implemented on computers and the complex of system-wide facilities. From a methodological point of view, some of the main results of the effort performed in the first phase are the design solutions that achieve integration of design and consistent introduction into planning practice of economic and mathematical methods and computer hardware [1].

In accordance with the 12 July 1979 decree by the CPSU Central Committee and the USSR Council of Ministers, "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing production Efficiency and Work Quality" [2, p 32], in the 11th Five-Year Plan we have to complete the introduction of the ASPR for development of alternative plans and optimization of plan decisions with extensive use of physical and value balances of production and distribution of output, production capacities, labor and financial resources and system of plan normative provisions. Aimed at solving these problems is the ASPR second phase development program, within which the construction of the system of calculations on computers has to be completed to support drafting of:

draft guidelines for USSR economic and social development for 10 years (by five-year periods), and check figures on the main indicators and economic normative provisions for the forthcoming five-year plan with distribution by years;

draft of the five-year plan for USSR economic and social development (with distribution of quotas by years);

draft of the plan for USSR economic and social development for the forthcoming year;

and analytic indicators for monitoring the course of fulfillment of the long-term and annual plans for USSR economic development.

ASPR improvement will proceed along the path of integration of plan calculations with the OASU [automated sector management systems] of the ministries and departments and territorial managerial agencies.

In preparing the ASPR second phase, efforts must be concentrated on the problems whose solution will make it possible to:

establish the information-methodological principles for computer system calculations of the interrelated indicators of the state plans--long-term, five-year and annual;

draft scientifically substantiated alternatives for plan decisions and ensure selection of the best of them;

more fully consider in plans social needs and provide for satisfying them with the most efficient use of labor, physical and financial resources;

intensify the complex influence of the plan and economic levers and incentives on accelerating scientific and technical progress, improving product quality, raising the efficiency of social production and achieving the highest end results;

achieve balance of the plans based on improving the system of physical and value balances, and the balances of productive capacity and manpower;

lay the foundation for a system of physical and value normative provisions for all levels and conditions of planning;

achieve the combination of sector and territorial principles of planning;

raise the effectiveness of external economic ties;

make more extensive use of the program-target method in planning; and

intensify work on monitoring the course of fulfillment of the plans.

These requirements will be met by expanding the range and improving the qualitative composition of the economic plan problems handled by computers based on implementing the fundamental provisions of the ASPR conceptual design and the detail designs of the functional subsystems. The composition of these problems to be introduced within the second phase into the computer calculation system is defined by the level expected by 1985 of development of hardware, software, technological and informational support, applied methods of economic and mathematical modeling and by the resources of skilled cadres of ASPR developers. In the second phase design task, we have scheduled for unconditional inclusion in the computer calculation system the most important problems whose introduction into the practice of drafting and monitoring the fulfillment of plans will facilitate solving the problems of improving planning that were imposed on the appropriate agencies by the 25th and 26th CPSU congresses and the 12 July 1979 decree by the CPSU Central Committee and the USSR Council of Ministers.

Main Directions of Development of Functional Subsystems in Developing the Second Phase of the Automated System for Plan Calculations

The unification of plan problems considered within the framework of functional subsystems into complexes and then into the plan calculation system is a major part of the effort in introducing the ASPR in the 11th Five-Year Plan [3].

Integration is achieved on the basis of using system-wide and standard methods and means through joint (sequential or parallel) computer handling of the functionally interrelated problems which allows obtaining a result common to the entire complex. This unification of problems requires mutual coordination of their information flows and ordering and coordination with each other of the methods and technology for solving them. In the process, the amount of data to be input into the computers is being substantially reduced, information holdings are being combined and the time expended on the problems is being considerably reduced compared to the total time for offline calculations for them; consequently, the requirement for machine time is being reduced relatively.

The set of complexes of problems to be solved with computers in the consolidated and sector subsystems is making it possible to achieve linkage of them by types (long-term, five-year and annual) and stages of drafting of the plans, to create the prerequisites for organizing the information holdings for these complexes, to define the required computer and office hardware needed to implement them, and to organize coordination between the ASPR subsystems of various levels and the OASU's and based on standard algorithms for uniform problems, a solution that ripples through from the gosplans of the union republics, the ministries and departments to the corresponding departments of the USSR Gosplan. Thus, for the sector functional ASPR subsystems, a standard set of complexes of plan problems has been established that, on the one hand, will make it possible to conduct a study of the most essential problems of a development of a sector in their tie-in with development of other sectors, and on the other hand, to achieve interface of sector problems with problems of consolidated subsystems through, for example, forming in the consolidated subsystem limitations on the requirement for resources for a sector problem. The makeup the standard complexes has been defined for the following blocks of the sector subsystems: "Consolidated," "Science and Technology," "Norms and Normative Provisions," "Production," "Capital Construction," "Supply of Materials and Equipment," "Labor and Cadres," "Environmental Protection," "Production Cost and Profit," "Territorial Section of Plan," " External Economic Ties," and also for the consolidated subsystems that are built so that the conditions are created for forming major intersubsystem complexes for their subsequent synthesis at the level of consolidated planning.

Let us briefly describe those new aspects of the interaction of the functional ASPR subsystems of the USSR Gosplan with each other as well as with the ASPR of the union republic gosplans and external ASU's that support implementation of the corresponding measures to improve planning [4].

In the decisions of the 25th and 26th CPSU congresses, the necessity of a balanced state of the plans based on improving the system of physical, labor and value balances was stressed. Within the second phase of the ASPR in the subsystem "Consolidated National Economic Plan" and all the consolidated-balance subsystems, further expansion of the range of balance calculations is planned. Automation of the construction of the balance of the national economy, improving the methods of calculating the value and physical-value intersector, single-product and consolidated material balances and manpower, and automation of the calculation of the balances of fixed capital, production capacity and capital investment and financial balances must support solving the problems stemming from the 12 July 1979 decree by the CPSU Central Committee and USSR Council of Ministers.

Based on consideration of mutual algorithmic requirements and the use of a common information base, the consolidated functional subsystems "Production Cost and Profit," "Norms and Normative Provisions" and "Introduction of Scientific and Technical Achievements in the National Economy" must be closely coordinated with the subsystem "Consolidated National Economic Plan" and the consolidated balance subsystems "Material Balances and Distribution Plans" and "Labor and Cadres" in executing the entire complex of balance calculations.

To achieve unity of the physical and value proportions to be established in the plan, the planning agencies must define the direction of change of prices, based on which the price formation agencies will be able to develop stable (for the five-year plan) price lists. Therefore, in the second phase of the ASPR, in the "Prices and Price Formation" subsystem it is planned to formulate problems on accounting for the effect of price changes on product production cost, size of profit, etc.

To strengthen plan influence on speeding up scientific and technical progress, improve product quality and establish conditions for getting new ideas through the whole chain--from inventions to mass production--as fast as possible, the plan problems in the "Introduction of Scientific and Technical Achievements in the National Economy," "Introduction of Computer Technology in the National Economy," "Capital Investment" and "Planning and Surveying Work" subsystems must be tied in together in the process of the functioning of the ASPR second phase.

The 12 July 1979 decree by the CPSU Central Committee and USSR Council of Ministers calls for development of five-year plans "based on a system of scientifically substantiated norms and normative provisions" [2, p 11]. To this end, the "Norms and Normative Provisions" consolidated subsystem is being developed in the ASPR second phase. The automated formation and application in balance calculations of the system of scientifically substantiated norms and normative provisions on types of work, labor inputs, raw materials and physical, fuel and energy resources and use of production capacity and specific capital investment will create the conditions needed to further elaborate the normative-balance method of planning and to reach on this base a qualitatively higher level of all the work on plan compilation. Complexes of plan norms for consumption of the corresponding types of resources must be developed in all consolidated subsystems, and complexes of norms of consumption of resources for production of corresponding products--in the sector subsystems.

The norms are to reflect and prescribe the socially needed labor input and its physical, labor and value proportions. At the same time, production conditions themselves take shape over the long term under the determining influence of scientific and technical progress. Therefore, production support, provided for by the plan, by all the types of resources must be established according to the norms taking shape as a result of introducing scientific and technical achievements in it. To solve these problems, in the ASPR second phase are planned preparation of methodological materials and implementation of the corresponding calculations within the subsystems "Introduction of Scientific and Technical Achievements in the National Economy" and "Norms and Normative Provisions."

The subsystems "Standard of Living of the People" and "Labor and Cadres" are to facilitate improvement of the ecological and social conditions for the people and satisfaction of the growing needs of the population. In the first of these subsystems, for long-term planning a complex of problems will be developed for forming rational and normative consumer budgets for the population as well as the differentiated balance of the population's income and consumption; based on them, the structure of the final product will be defined for calculations of the system of intersector balances. For these same purposes, calculation of the distribution of manpower engaged in the national economy by occupational skill groups and wage levels has to be performed in the "Labor and Cadres" subsystem.

The next major problem is improving territorial planning. Coordination and interconnection of the indicators of the state plan in the territorial section supports the integration of the socioeconomic development of a specific region, substantiation of plans for traffic and development of transportation, the capability of planning long-term direct links between sectors and associations and comprehensive satisfaction of the population's needs. Development of physical balances on a territorial profile is planned in the "Territorial Planning and Siting of Productive Forces" subsystem in coordination with others.

The prerequisites for compiling territorial balances took shape back in the first phase of the ASPR when optimization problems of development and siting of production were solved in many sectors for a considerable number of products, but independently of each other. In a number of cases, this could lead to concentration of production of various products in the same regions and formation in them of a shortage of physical resources or manpower. Physical balances on a territorial profile allow tying these problems together, and the possibility of optimizing these balances emerges based on interregional systems of models.

Along with this tie-in, in developing the second phase of the ASPR, it is planned to coordinate these problems using a scheme of multistep optimization with intersector calculations on the national economic level, which will allow achieving a complex balance of intersector, sector and interregional proportions of development of the economy.

The decisions of the 25th and 26th CPSU congresses bind us to intensify the complex influence of the plan and economic levers and incentives on accelerating scientific and technical progress, improving product quality, raising the efficiency of social production and achieving the final national economic results. Economic incentives and stimulants must be effective in the same direction as the volume quotas of the plan; therefore, they must be tied more closely to the quotas referred to. For these purposes, methods of forming and using long-term economic normative provisions in compiling financial balances are to be developed in accordance with the 12 July 1979 decree of the CPSU Central Committee and the USSR Council of Ministers in the "Financial Balance of the State" subsystem in the second phase of the ASPR.

The coordinated solution of all complexes of economic plan problems in introducing the ASPR is to achieve a central complex of them [5] which is to be used to tie in: calculations of the balance of the national economy and intersector balances; consolidated calculations of the plan for production and physical balances, balances of fixed capital, production capacity and capital investment, financial resources and manpower; calculations of the basic indicators of the functional sections of the plans (standard of living, science and technology, production cost and profit, external economic ties) to be executed in the corresponding consolidated subsystems; calculations of demand for products of a sector, plans for production and their support with the physical, labor and financial resources at the level of sector subsystems.

Functioning of the central complex of economic plan problems will be based on the iterative process of coordinating final social needs and national economic resources stemming from the overall logic of planning represented in the fundamental scheme of the unified system of plans of the conceptual design of the ASPR and made concrete in the functional structural schemes for development of current and long-term plans for detailed designs of the functional subsystems.

A major direction in improving planning is to further improve monitoring the course of fulfillment of state plans for economic and social development. In designing the second phase of the ASPR, in all functional subsystems, computers must be used to solve the corresponding problems that will support acquisition and analysis of report data, forecasting the expected fulfillment of the plan by each of its sections, revealing the causes of deviations of the actual course of plan fulfillment from plan assignments and the consequences of these deviations for the whole national economy, substantiation of proposals and forming of measures to achieve the plan and bringing them to the executors.

Characteristic for the second phase is not only the joint solution of complexes of plan problems of the functional subsystems of one level, but also the organization, in the process, of close coordination between the various levels of the ASPR as well as between the ASU's of the ministries and departments. For these purposes, it is planned to interface the second phases of the USSR Gosplan ASPR with the union republic gosplans' ASPR. The initial interface will be worked out between the USSR Gosplan GVTs [Main Computer Center] and the VTs [computer centers] of the UkSSR Gosplan and Lithuanian SSR Gosplan; then the results obtained will be disseminated to the other republics through suitable functional subsystems by coordinating the composition of plan problems at the various levels of planning.

Based on solving the problems of the second phase of the ASPR, through its Main Computer Center, USSR Gosplan will offer the union republic gosplans indicators of the list of projects to be implemented in their territory, amounts of planning and surveying work for future construction, siting of production of prodcuts, volumes of output of basic physical resources and requirements for them, population, migration, age and sex structure, composition of families and major indicators of the sector plan. In turn, the union republic gosplans will submit through their compute centers to the USSR Gosplan on machine media the draft plans for the comprehensive economic and social development of the union republic for their consideration and coordination and development on this base of consolidated indicators of the state plan on a territorial profile. At the same time, to raise the quality of plan decisions made at the level of the USSR Gosplan, gosplans of the union republics, ministries and departments and to achieve integration of the process of compiling the corresponding plans and monitoring of their fulfillment, it is planned to experimentally work out interaction of the ASPR with the USSR TsSU ASGS [Central Statistical Administration Automated System for State Statistics], the USSR Gossnab ASU, the ASU's of the ministries of instrument making, automation equipment and control systems, light industry and foreign trade, and the USSR GKES [State Committee for Foreign Economic Relations]. In introducing the ASPR, organizing its coordination with the automated sector management systems of the ministries and departments and achieving compatibility between these systems over all their parameters is becoming the central problem. Until it is resolved, it will be impossible to subsequently combine the automated systems into a state-wide system as called for by the decisions of the 24th, 25th and 26th CPSU congresses.

ASPR interaction with the ministry and department automated management systems is based on the compatibility of the corresponding subsystems. What is required is coordination of the plan problems considered in each of them, commonality of methods of solving those of the same type and mutual tie-in of them. For these purposes, in developing the second phase of the ASPR, schemes for coordination of complexes of problems at the levels of the USSR Gosplan, union republic gosplans, ministries and departments will be compiled. Information in the interacting systems must be recorded using unified facilities of formalized description of data, classifiers, dictionaries, unified plan documents and reporting forms. In the process, it is necessary to achieve compatibility of the data processing and transmission hardware and unity of data processing technology and to coordinate the sequence of solving the problems and transmitting results on machine media in the process of compiling plans and monitoring fulfillment of them. Organization of ASPR interaction with the ministry and departmental ASU's presupposes raising personnel skills based on common principles and training programs. Finally, unified legal norms for development and refinement of plans and for monitoring of its implementation as well as unified norms for the design and introduction of the interacting subsystems of the USSR Gosplan ASPR and the ministry and departmental ASU's.

Interaction between the USSR Gosplan ASPR and the USSR TsSU ASGS is of great importance for the efficiency and production of results of monitoring the course of fulfillment of state plans. It is effected by submitting statistical accounting data from the ASGS to the ASPR; the content, volume and periodicity of transmission of the data must correspond to the methods and technological schemes for conversion of information used in the ASPR. In turn, indicators of approved state plans will be sent from the ASPR to the ASGS. Organization of the interaction is realized in the problems of the second phase of the ASPR within the framework of its consolidated and sector subsystems and the subsystems of the USSR TsSU ASGS.

The problem linking the USSR Gosplan ASPR with the USSR Gossnab ASU is the improvement of the physical proportions of production and distribution of products. It must achieve integration of the process of development, refinement and monitoring the implementation of balances of material and equipment resources in the plan for distribution of products and an increase in the integration of planning of their production and distribution by nomenclatures of the USSR Gosplan and the USSR Gossnab, a balance of resources and demand, and timely exposure of disproportions that occur in fulfilling the plans for supply of materials and equipment. Interaction in the process of developing the second phase of the ASPR is organized within the framework of the consolidated subsystem "Physical Balances and Plans for Distribution" of the USSR Gosplan ASPR and the functional subsystem "Definition of Demand, Balances and Plans for Distribution" of the USSR Gossnab ASU. The unified system of norms and normative provisions for use of resources will be the foundation for the joint functioning of the USSR Gosplan ASPR and the USSR Gossnab ASU in solving the problem of supply of materials and equipment.

In developing the interaction of the USSR Gosplan ASPR with the ASU's of the Ministry of Foreign Trade, the State Committee for Foreign Economic Relations and the Ministry of Instrument Making, Automation Equipment and Control Systems, a standard scheme has to be developed to link the ASPR sector subsystem with the sector ASU's of the all-union ministries; interaction with the ASU of the USSR Ministry of Light Industry requires a standard scheme for coordinating the sector subsystems of the USSR Gosplan ASPR and the union republic gosplans with the sector ASU of the union republic ministry at the union and republic levels. The republic level of this scheme is being checked out by the UkSSR Gosplan and the UkSSR Ministry of Light Industry.

In introducing the ASPR, not all problems of application of economic-mathematical methods and computers are being solved in equal measure. This pertains, first of all, to development of a number of multisector complexes. Program-target complexes of problems are still poorly developed. Methodological debugging is now underway for compilation of target programs and their tie-in with the sector and territorial aspects of the plan. After it is completed, the formalized statement of the program problems can be made. The forecast-analytic problems of a long-term plan are still inadequately developed for a formalized statement. All these problems will have to be solved in the process of subsequent development of the ASPR. Then as a result of the work that has to be performed within the 11th Five-Year Plan, the main problem of the introduction of the ASPR will be realized: the functioning in real time of an automated data processing system that supports making interconnected plan calculations with computers, development of alternatives and optimization of plan decisions, and raising the state of balance and integration of state plans.

ASPR Second Phase Support Facilities

Successful development of the functional subsystems largely depends on the level of support facilities that must create the conditions for raising the level of integration, interconnection and efficiency of solutions in the process of preparing the state plans for economic and social development [3].

Let us briefly discuss the main areas of this work.

Methodological Support. Development of it jointly with the ASPR functional subsystems in designing the ASPR second phase based on the decisions of the 25th and 26th CPSU congresses, the Central Committee plenums and the 12 July 1979 decree by the CPSU Central Committee and the USSR Council of Ministers is to prepare proposals on refining the composition of plan problems and to define ways of improving the structure and systems of indicators of the long-term, five-year and annual plans to more fully reflect in them the questions of social development, scientific and technical progress, development of physical production, use of nature, socialist economic integration, improvement of management, as well as of methods of solving these problems.

Required for ASPR methodlogical support are scientific efforts to develop methods of forming major socioeconomic goals of development of the national economy, methods and models of social planning, planning of scientific and technical progress, development of multisector complexes and plan price formation. Research will be continued to improve the methodology of compiling the system of long and medium-term national economic forecasts, solve the methodological and organizational problems of achieving unity of physical and value indicators and proportions of the country's economic and social development, develop the methods and models of forming program, sector and territorial sections of plans and mutual correlation of them, preparation and experimental checkout of systems of economic-mathematical models of the functioning of the national economy and its elements as objects of plan management.

Information Support. Its basic task in introducing the ASPR is to form system-wide information holdings using the entire complex of information facilities under development. Here it is planned to place into service autonomous information holdings with use in them of a unified list of indicators, system of all-union classifiers and facilities for formalized description of data. On this basis, there has to be developed a system-wide stock of information on the complexes of problems of the ASPR second phase, after providing for in the process the capability of building it up and maximal convenience for the user.

Efforts of the unified list of indicators of the ASPR are being completed; based on this list, indicator descriptions are being normalized. This list is being used to develop a thesaurus of plan indicators and methods of content unification of plan forms and means of formalized description of data.

In making up the forms of plan documentation and refining the system of indicators for long-term, five-year and annual plans, it is planned to make extensive use of the unionwide classifiers of technical and economic information (OKTEI) approved by the USSR Gosstandart [State Committee for Standards] and thereby achieve the introduction of them into the practice of the work of the USSR Gosplan and the union republic gosplans. At the same time, preparation of the Unionwide Classifier of Technical and Economic Indicators (OKTEP) will have to be completed to apply it in planning.

Technological Support. Its design and introduction must be oriented to developing a unified technology for processing economic plan information in compiling state plans using YeS computers and modern data transmission equipment. Technological support for the ASPR second phase must satisfy the requirements to both solve the ASPR functional subsystem problems introduced and to subsequently include in the calculation system those to be placed in operation. For this, we have to work out the technology and organization of solving economic plan problems of the ASPR subsystems on the base of computer systems with a sophisticated video terminal network and achieve: on-line correction of source information stored in computer devices; remote control of operations performed with computer systems; use of interactive information retrieval systems and technological processes of debugging programs.

It will be necessary to introduce processes for exchanging information between computer centers using machine media and communication lines and for solving ASPR second phase problems in the departments of the USSR Gosplan and the union republic gosplans with minicomputers both in the offline mode and by connecting the minicomputers to the terminal network of the USSR Gosplan or the union republic gosplan.

Hardware. Development of the hardware complex within the framework of the ASPR second phase must be aimed at establishing a network of computer centers of the USSR Gosplan and the union republic gosplans based on YeS computers as a component of the future Unified State Network of Computer Centers. This complex must consist of large computer systems installed in the computer centers and minicomputers in the departments of the gosplans.

A terminal network is being developed in the USSR Gosplan and the union republic gosplans to support the interactive mode. Video terminals, printers, input-output devices and places for installing them will be chosen on the basis of the technological schemes for information processing.

To raise labor productivity on putting information into computers, special devices that allow recording information from documents directly onto magnetic media are being assimilated in the USSR Gosplan Main Computer Center and the union republic gosplan computer centers.

During development of the ASPR second phase, efforts must be made to install and use in the departments of the USSR Gosplan and union republic gosplans domestic minicomputers with subsequent inclusion of them in the interactive complex of hardware as intelligent terminals.

Software. It is oriented to the YeS computers and the OS/YeS operating system. In this are, we have to: introduce a general-purpose system of problem programming in a high-level language (PL) supported by procedures that are typical for solving plan problems; develop standard software relying on standard application program packages for the YeS computers with the necessary refinements to take the specific nature of ASPR problems into account; place into service special programming facilities for mass ASPR second phase problems designed to be used by non-professional programmers.

Based on systems developed and supported by industry, it is planned to develop and introduce software for automated data banks (ABD), keeping in mind first of all servicing a system-wide information stock for solving ASPR second phase problems, and programming systems for online input and output of data through terminals, including minicomputers. It is planned to develop the holdings of algorithms and programs organized in the first phase of the ASPR and to expand exchanges of programs between the USSR Gosplan Main Computer Center and the computer centers and scientific research institutes of the gosplans of the union republics, ministries and departments.

Personnel Support. Based on the information retrieval system "Cadres" adopted for operation in the first phase, preparation of a unified information system for personnel accounting in the USSR Gosplan and union republic gosplans will be continued, and measures will be implemented to raise the skill of workers taking part in solving plan problems with application of computers. In the realization of these problems, an important role will be played by the Higher Economic Courses at the USSR Gosplan that will assume the function of the training center both to prepare planners for operating under ASPR conditions and the ASPR developers. For this, it is planned to organize under the scientific and methodological guidance of the Higher Economic Courses a unified system of training centers for the USSR Gosplan and union republic gosplans and to teach in them (using differentiated training plans and programs with extensive application of modern equipment in the training process) the methods and means of solving plan problems of the ASPR second phase to the workers in the plan agencies and their computer centers.

Legal Support. It is planned to develop regulations establishing the procedure and features of using the technological processes of making calculations with computers in the practice of operation of the plan agencies and their structural subdivisions and to prepare normative instruments: regulating the organization and procedure for acquisition, accumulation and storage of economic plan information in the process of the functioning of the automated data bases; and defining the status of the file of information on machine media and documents that are obtained from computers as well as the responsibility for the validity of information output from computers. In addition, we have to develop a legal regulation on authorized access to information stored in the automated data banks, instructions on the procedure for preparing, formatting and submitting for approval the documents formed with computers, and normative instruments establishing rules, obligations and responsibility of plan workers for adhering to the technological processes of compiling plans and the technology of making calculations.

These efforts will serve as the basis for developing collections of departmental normative instruments on questions of application of economic-mathematical methods and computers in planning.

Management of the development of State Plans for Economic and Social Development. For the functioning of this subsystem, methods and ways are required to improve the technology of drafting plans by types and stages of planning under ASPR conditions. Computers will be used to monitor the stages and schedules for compiling plans, to form proposals on the priority of plan problems to be solved with computers and in accordance with this to redistribute machine time resources. An information statistical data base with software has to be developed to manage plan drafting.

Thus, the support facilities within the second phase of the ASPR will make it possible by using man-machine technology to compile plans for economic and social development, to effect integration of the system of balance calculations, optimization problems and data processing problems, and to work out the interaction of the ASPR with ministry and departmental ASU's. Further ASPR development will occur on the unified system basis to raise the quality of draft state plans for economic and social development and to improve methods, organization and technology of planning. For this, in the 12th Five-Year Plan already, based on the ASPR, unification of the processes of preparing plans at the national economic, sector and territorial levels will be carried out in the USSR Gosplan, union republic gosplans, local plan agencies, ministries and departments.

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STATUS, DEVELOPMENT PLANS OF AUTOMATED PLAN CALCULATION SYSTEM IN KAZAKH SSR

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 1, Jan 81 pp 51-53

[Article by K. Tlegenov, director of the Scientific Research Institute for Automation of the Processes of Planning and Improving Management Structures at the Kazakh SSR Gosplan, and B. Konakov, chief of the department of the ASPR [automated system for plan calculations] for the consolidated national economic plan of the institute: "The ASPR Proposes the Optimal Alternative"]

[Excerpt] At the USSR Gosplan and the union republic gosplans, automated systems for plan calculations (ASPR) are under development and other technical facilities are being introduced for the scientific organization of labor of plan workers.

Just what exactly has been done in our republic? The first phase of the ASPR has been operating since 1976, and the first stage of its second phase is being prepared for turnover for service.

Currently, economic plan tasks are handled by 20 functional subsystems, and the total number of task complexes is on the order of 300. Among the most sophisticated subsystems delivered as part of the first phase and which have undergone development are "Labor and Personnel," "Agriculture," "Consolidated National Economic Plan" and "Construction Materials." And on the latter subsystem, our institute is the authorized lead developer for all union republics.

By degree of assimilation of tasks, ASPR's are divided into those introduced into permanent operation and those undergoing a "test run." The handling of the economic plan tasks introduced into practice and the tasks being worked out in the process of test operation allows releasing specialists from performing laborious operations, and increasing time for analysis of results and substantiation of decisions being made.

Putting the first phase of the ASPR into service made it possible to solve a number of new and very important problems. This would have been out of the question without the use of computers. This pertains primarily to calculating the very laborious alternatives. And this means that quality of plans is being raised.

The economic effect from use of the system in calculating for a year was 3.2 million rubles. Expenses for introduction of the first phase were recouped in a little over a year.

As a result of handling the tasks of the first phase, the computer outputs about 30,000 tables for various purposes; 60 percent of them are tables for drafting the national economic plan. The computer also outputs analytic tables, forecast results and solutions to optimization problems that are used to analyze the development of the national economy and fill out plan forms.

In their economic content, the tasks being handled cover forecasting and calculation of the basic indicators of development of the republic's economy, demographic calculations, capital investment plan calculations, demand for physical resources and products of the sectors, calculations of norms and normative provisions and a number of others.

In operating the first phase of the ASPR, bottlenecks have been exposed. They include the following:
-- plan calculations made on the computers are an insignificant fraction of the entire process of drafting a plan and do not cover all its sections and areas;
-- localness of tasks being handled (there are no links for exchange of information on machine media);
-- reliability of operation of the hardware complex and its capacity are inadequate, which is especially felt in peak loads when national economic plans are being compiled; and
-- there is no information interaction with external systems (all information, including statistical and normative, comes from the republic's Gosplan).

Analysis of the practical use of the ASU's and the design and technical literature for developing them shows that further development and improvement of the ASPR must proceed along these directions: expansion and improvement of the functional composition of tasks being handled so that the system under development corresponds more fully to its basic purpose--improving the technique of national economic planning; development of supporting facilities to realize these methods; and improvement of the methodology and organization of design and introduction of the ASPR.

Expanding the functional composition of the ASPR is determined by the basic directions for improving the system of planning, among which the most important are:
-- raising the purposefulness of plan calculations for achieving final results;
-- compilation of an optimal plan for development of the national economy;
-- raising the interconnection of the sections of the national economic plan and level of its balance and validity; and
-- fuller combination of sector and territorial planning.

Development of the functional composition of the tasks is being achieved by the development and introduction of new tasks as well as by improvement of those now being handled. The latter is being achieved through complexing of tasks and the fullest provision of information.

The following complexes now under development will be of no little improtance: consolidated complexes for forecasting basic indicators of development of the republic national economy and for calculating indicators for capital investment and sector subsystems in coordination with tasks of a consolidated nature; complexes of free economic plan calculations on labor and the balance of manpower, calculations for the plan on distribution of physical resources for repair and operation of fixed capital, and calculations of the normative provisions of sector planning on the example of the consumer services sector; and the basic complexes of the sector subsystems for the units "Production" and "Capital Construction."

Incidentally, let us note that while in the first phase of the ASPR handling of major tasks was automated only at the republic Gosplan level, in developing the system further it is planned to cover tasks at the level of ministries, oblasts and enterprises, i. e. it is now a question of developing the ASPR of the Kazakh SSR.

To expand the functional composition and preclude parallelism in preparing the tasks of planning in the sectors and at the level of the republic Gosplan, organizational measures are being implemented to draw the ministries and departments into the development of the sector subsystems of the ASPR. For this, in accordance with the recommendations of the Interdepartmental Council on Introduction of Computer Technology and Automated Management Systems in the National Economy, a long-range coordinated plan has been compiled to develop and introduce the ASPR in the republic with the participation of the interested ministries and departments. Based on this plan, the planning tasks that ripple through the levels (enterprise--ministry--republic Gosplan) will be compiled and adjusted by one collective of developers of the sector automated management system (OASU), and then sent for operation to the appropriate planning levels.

Expanding the use of automation equipment in the practice of planning down to the level of local plan agencies will raise the quality of territorial planning and allow in reality implementing the idea of comprehensiveness by tying in and coordinating the sector, departmental and territorial sections of the plan.

Not enough has been done yet to provide information for solving economic plan problems directly from the external ASU's. This is due primarily to the lag in development of the sector and territorial management systems, and especially the subsystems, units and problems of planning in them.

Development and testing of an automated data bank has been proposed to develop information support. It is planned to carry out the first stage of the work on the subsystems "Consolidated National Economic Plan," "Capital Investment," "Agriculture" and "Construction Materials."

Development of a reference system is planned for the "Consolidated National Economic Plan" subsystem. It will hold information on the industrial enterprises on an independent balance. There have already been developed unified forms, adapted for computer entry, of a passport with all the information describing the industrial enterprise and reflecting its activity, as well as data on the basic indicators of development of the republic national economy for past, current and future periods. The system will be fed information from the information holdings of other ASPR subsystems.

It is planned to use the "Capital Investment" subsystem for processing and managing the title lists of republic projects. The priority task of the reference system on agriculture is to gather and process data on production and purchases of sector produce.

All these subsystems and systems will yield a substantial effect only when reliable interaction of them is organized with the use of unified classifiers of technical and economic information.

Organization and automated management of classifiers of technical and economic information together with a developed system of formalized description of data will allow establishing a unified information base and achieving the functioning of an ABD (automated data bank) under the conditions of permanent operation of ASPR tasks.

Software will be improved by assimilating the operating system of the machines in the unified series, the data preparation and teleprocessing systems of the data base management system, and by the development, assimilation and repetitive use of standard program modules in solving the various classes of ASPR problems. More profound assimilation of the capabilities of the programming languages and operating system will lower labor costs and raise the quality of programs.

To improve methodology and organization of design, we are faced with development of the other interrelated systems--the ASPR for the oblast and the planning subsystems of the OASU, the ASFR [automated system for management of financial calculations], the ASU MTO [automated system for management of supply of materials and equipment], etc.

So that all these systems can function together, organizational and methodological work will have to be carried out to achieve interaction of the systems. We will also be engaged in standard design of the ASPR. Standard design solutions allow saving on labor costs in developing a system and raising the quality of developments. Required in turn is a more thorough preparation of design solutions, and full and strict consideration of system requirements with respect to methodology, information and software.

Development of support facilities in the third stage must be aimed at meeting the most important needs of Gosplan specialists--at developing an information reference system capable of on-line output of needed information.

An information reference system under Gosplan conditions has a multipurpose function: it may be used for development of plan indicators, monitoring plan execution, making forecasts and output of responses to various queries.

Development of this information reference system is a laborious and lengthy affair, but work in this area is now underway and expansion of it is planned.

Realization of these directions will allow raising the quality of the automated system for plan calculations and consequently the quality of national economic plans.

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COMPUTER APPLICATIONS IN UZBEK SSR SUMMARIZED

Tashkent EKONOMIKA I ZHIZN' in Russian No 2, Feb 81 pp 53-73

[Report from Uzbek SSR Gosplan: "The Future is Being Programmed Here"]

[Excerpt] Confident Step of Cybernetics

To cite some figures: Ten years ago we had 13 computer centers and 60 computers. Now there are 108 computer centers and 390 computers on the territory of Uzbekistan. To replace the computers performing 6,000 to 20,000 operations per second, the second and third generation machines have arrived that are capable of performing from 80,000 to 1 million operations. With that, the calendar load on the computer pool has more than doubled and has exceeded 12 hours per day. Today in the republic, there is essentially not one sector of the economy that could do without the help of computers....

We are talking with Mark Grigor'yevich Tsvifel', chief of the Department of Introduction of Computers and Control Systems and member of the UzSSR Gosplan. He says that under the conditions of the rapid development of the science of control and widespread use in this field of modern computers, there has been an increase in the scale of the department's activity and its responsibility for planning, coordinating and monitoring the course of development of the network of automated control systems (ASU). This network is rather vast and includes more than 90 ASU's for sectors, associations and enterprises, organizations and institutions in the Uzbek SSR.

Today there is not one enterprise nor organization that does not have a right in its own judgment to develop its own ASU or acquire a computer. All proposals, estimates and substantiation by the ministries and departments on this score are submitted to our department, and only after thorough study is a decision made that then has to be coordinated with USSR Gosplan.

This study provides for all stages of ASU development--from design to definition of the schedule for putting its subsystems and individual tasks into operation, including questions of financing, construction, supply of materials and equipment, personnel needs and, of course, system efficiency. Then a schedule is compiled to implement the plan and all its tasks specifying concrete time periods and performers. Department associates strictly monitor compliance with these schedules.

It should be emphasized that we actively monitor the performance of the plan tasks. This means that upon detecting deviations from the schedule or cases of failure of particular measures, we determine the causes of the violations, outline ways to eliminate them and render needed help to the extent possible.

However, we have to improve this monitoring function, expand and deepen it. We have already begun shifting from sampling checks by specific indicators to comprehensive: For each specific ASU, our associates establish the actual number of problems solved within its framework and determine how much it corresponds to the estimated and practical economic effectiveness incorporated in the design and defined in the document for putting it into operation. When full use is not being made of the computer, we outline measures to bring it up to normative provisions.

Concern for efficiency in use of computers is dictated by the fact that they are the highest costing type of all industrial equipment. Each third-generation computer costs from 600,000 to 700,000 rubles. While, for example, the cost of a lathe is about 2,500 to 3,000 rubles. Consequently, the money spent on one computer would be enough for 200 to 250 lathes which is entirely adequate for equipping an average machine manufacturing plant.

A modern computer is very expensive and therefore its usage factor is measured not in hours of operating time, as it is for the lathes, but in calendar time of days, taking into account operation of the machines on days off and even holidays.

Despite the fact that the calendar load on the pool of computers in the republic has substantially increased, this does not disturb us at all. The fact is that the load on the various computer centers is far from identical. And after all, each hour of machine time costs 80 to 100 rubles!

It is absolutely impermissible when computers are inactive for a long time because of delays in putting machine rooms into service. But such things have happened. For example, in the Ministry of the Construction Materials Industry, the Goskomsel'khoztekhnika [State Committee for Agricultural Equipment], the Goskomvodstroy [State Committee for Hydroeconomic Construction] and the Sredazirsovkhozstroy [Central Asian—expansion unknown—State Farm Construction].

A characteristic of the past five-year plan is the expansion of the "geography" of computer use. While 10 years ago all the computers and information computer centers were concentrated just in Tashkent, today they are operating in the majority of oblast centers and in Karakalpakskaya ASSR as well as in the cities of Angren, Almalyk, Chirchik, Yangiyul' and Margilan. The information computer center of our Gosplan has its own branches in Namangan and Karshi. Computers have been installed in some oblast statistic administrations and major VUZ's in the republic.

We consider a major direction of our work the establishment of multiple-use computer centers for a group of homogeneous enterprises of a ministry or department, or even of several related sectors. Though each of these subdivisions has its own ASU, it need not have its own computer center. Here is persuasive evidence for you: to date, 512 organizations in the republic, without their own computer, are successfully using the services of other computer centers, renting machine time from them. Practice shows that this is much cheaper than acquiring their own computers.

The largest collective-use computer center (VTsKP) in our republic's capital is to be put into service in this five-year plan. Equipped with computers of future generations, it will begin serving departments, associations, enterprises and organizations irrespective of subordination. A second, no less important, function is to serve as the hardware base for the upper level of the Republic Automated Management System now under development.

Organization of design of automated management systems has somewhat improved in past years. Specialization of individual planning and design organizations on specific areas has had a positive effect. But we still have organizations in the republic that do the design work for establishing an ASU with their own efforts. Experience shows that this is more expensive and this practice must be eliminated as soon as possible.

An important problem in engineering policy in establishing ASU's is improving design work to make more extensive use of standard designs and application program packages. This will allow reducing the time and cost of development of designs while quality will be improved at the same time. And reducing design cost is an improtant reserve for raising ASU efficiency. Design development for one ASU accounts for just about half its total development costs.

Our department has been and remains concerned with problems of training personnel for higher and middle skills. No little has been done in this area. Specialized schools have been set up and are operating at the Tashkent State University imeni V. I. Lenin and the polytechnical and national economic institutes. This has made it possible to increase fivefold the production of specialists with cybernetic degrees in the past 10 years. Nevertheless, training of them lags behind the growing demand. Evidently the time has come to organize a republic specialized institute on the base of the existing cybernetic schools.

We have been paying, and will naturally continue to pay, special attention to developing the automated system for plan calculations (ASPR) of the UzSSR Gosplan and to improving the activity of our Information Computer Center. It has already gained specific experience in automating plan calculations in the subdivisions of the UzSSR Gosplan. About 5,000 calculations were made using the computer just in the period of preparation of the draft plan for the economic and social development of the republic's economy for 1980. Besides that, jointly with the Gosplan departments, the IVTs [information computer center] solved many optimizational, balance and forecasting problems last year.

All work on using computers in planning is done within the framework of developing the automated system for plan calculations--a basic link in the republic ASU. The first phase of the ASPR went into full-scale operation at the start of the past five-year plan, and the first stage of the second phase was accepted at the end of it--in December 1980.

As is known, it was stated in the decree by the party and government on the improvement of the economic mechanism that introduction of the ASPR should be completed in the 11th Five-Year Plan "with extensive use of natural and cost balances of production and distribution of output, productive capacities, manpower and money and the system of plan normative provisions." The republic Gosplan at the start of last years discussed and approved measures to complete development of the second phase of the ASPR. And our task is to implement them together with the IVTs.

And, finally, a very important direction of our work for the future is expanding the scope of the problems handled on computers, because it is the multiversion, optimizational balance calculations that make it possible to most fully reveal and make efficient use of existing resources and reserves.

In conclusion, it is necessary to stress the great role in all the activity on introducing computers into management and planning of the republic interdepartmental council on questions of improving management in the national economy, which is headed by Kudratilla Akhmedovich Akhmedov, deputy chairman of the Council of Ministers and chairman of the Uzbek SSR Gosplan.

In essence, all fundamental questions and directions in this area are discussed and determined by the council: stages of development of the RASU [republic automated management system], development of the republic network of data transmission for the ASU's, the course of development and introduction of automated management systems in the various ministries, associations and enterprises, training of cybernetic personnel, dissemination of expertise, the conduct of republic inspections of computer centers and many other major problems.

As the operating agency of the council, the department's task is to prepare the materials for its consideration on time and with quality and to monitor fulfillment of the decisions made by it.

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UZBEK CONTINUING COMPUTER UTILIZATION DIFFICULTIES REVIEWED

Tashkent EKONOMIKA I ZHIZN' in Russian No 4, Apr 81 p 24

[Article: "'Full Utilization for Computers'"]

[Text] An article by the deputy director of the Uzbek SSR Gosplan Division of the Introduction of Computer Technology and Control Systems, Kh. Khodzheyarov, was published under this title in the eighth issue of this journal last year. In this article a number of departments and organizations were named which did not provide for the standard utilization of computers. The editorial board received responses to this publication.

In a letter signed by Deputy Minister of the Uzbek SSR Meat and Dairy Industry M.A. Abdullayev, the incomplete utilization of the YeS-1020 computer is explained by the unsteady performance of the air conditioning system in the area of the computer room, as well as by downtime resulting from the technical malfunctioning of peripheral equipment. The installation of four BK-1500 air conditioners has made it possible to increase the mean-24-hour utilization of a computer to 10 h, as called for by the norm. Nevertheless, the ministry does not consider this the limit and is carrying out a number of measures which will make it possible to increase the utilization of the computer to 11 h. In particular, larger-capacity air conditioners--BK-2500's--will be installed for the purpose of enabling the required temperature conditions, IVTs [data processing and computing center] areas are being constructed for the purpose of improving the computing process and additional peripheral equipment has been ordered.

The Uzbek SSR Ministry of the Construction Materials Industry was subjected to criticism for delay in putting into service the YeS-1033 computer which has been standing idle since May 1979. The reason was the untimely preparation of space. Deputy Minister G.F. Shevchenko acknowledges that the criticism is valid. However, he believes that the ministry has performed its functions as a customer. The supplier is Glavtashkentstroy [Tashkent Central Construction Administration], which has systematically since 1978 not observed deadlines for the completion of construction and installation work.

What is true is true. Cases when computers have stood idle in crates for a long time through the fault of builders are unfortunately far from infrequent. But it must also be said that one of the functions of a customer is also the making of proper exacting demands on the contractor. The role of a passive observer is inappropriate here. Incidentally, the ministry itself was convinced of this.

Having displayed maximum persistence after publication of the journal, it achieved completion of the construction of the computer room and the computer was put into service in December of last year. The problem now is to ensure its steady operation and full utilization.

It was mentioned in the article that computer technology is being utilized insufficiently effectively in the "Malika" Knitwear Production Association and at the Tashkent Textile Combine. The general director of the textile combine, A.B. Burkhanov, reported to the editorial board that the main reason for the low computer utilization consisted in the lack of ASU tasks prepared for industrial implementation. The Tashkent PKB ASU [Planning and Design Bureau for Automated Control Systems] delayed by almost a year the development of tasks for the first phase of the combine's automated control system. This is the case when the designers do the supplying, which also still takes place.

In the time which has elapsed the situation has leveled off somewhat. The PKB ASU has accelerated work on preparation of a work project for tasks and part of them have been put into industrial service. Part, but not all. As a result, the utilization of the YeS-1022 computer, although it has increased to eight hours, is still two hours behind the standard.

The general director of the "Malika" Knitwear Production Association, B.K. Irgashev, writes that on account of the faultiness of two magnetic disk storage units installed back in 1977 the YeS-1020 computer has operated unsteadily from the very beginning. Its mean annual downtime has equaled more than 500 h (with two-shift operation). To top it all off, in January of last year these units failed completely. While the squabbling went on with the manufacturing plant the computer lay idle. Finally the storage units were restored but it was then found that it was necessary to redebug the magnetic disks. Forced downtime once again.

In the existing situation it was decided to set up in the association's computing center a computing complex whose structure would include part of the YeS-1020 equipment. This made it possible, as reported by the general director, to compensate by 50 percent the downtime of the computer resulting from the lack of a direct-access storage unit. According to the data of the Uzbek SSR Central Statistical Administration, utilization of the computer in the association amounted to 6.6 h on 1 January 1981, which is two hours less than on the same date in 1980. What kind of compensation is there to speak of? Incomprehensible. It is only clear that the computer is working less than half of the time called for, and this with the acute shortage of computing capacities which the association is experiencing.

Among the organizations not able to utilize fully their computer equipment named in the article was the Uzbek SSR Ministry of the Cotton Ginning Industry. First Deputy Minister A.D. Sapon explains the low productivity of the YeS-1022 computer by the fact that satisfactory conditions have not been created for the work of either the equipment or of computing center associates. And although something was done to correct the existing situation, the conditions for operation of the computer do not meet technical requirements. Unfortunately, it remains unclear on whom the creation of satisfactory conditions depends. In the final instance, not on the ministry itself, it seems.

The first deputy minister concludes his letter to the editorial board optimistically: "In spite of the difficulties mentioned the intent is to increase the computer's utilization to the norm." However, with the reservation "to the extent that working conditions permit." But the data of the republic's Central Statistical Administration do not give grounds for optimism. In 1979 the computer in the ministry's computing center operated a mean-24-h 6.6 h and in 1980 slightly longer--8.4 h--but it is still a very long way to go to the norm (15 h). It is obvious that the ministry must take more decisive measures for the purpose of ensuring the maximum utilization of such expensive equipment as that of the computing center. It does consist of more than 100 associates.

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UZBEK SSR AUTOMATED CONTROL SYSTEM SAVINGS ADVANTAGES NOTED

Tashkent EKONOMIKA I ZHIZN' in Russian No 3, Mar 81 pp 48-49

[Article: "Utilizing the Capabilities of Cybernetics"]

[Excerpts] Eight years ago directive agencies made the decision to develop and introduce a republic automated system for controlling the socialist economy of the Uzbek SSR (an RASU).

In successively completing this large-scale purposeful program, scientific and planning and design organizations and specialists at large computing centers of the republic during the period which has elapsed have done positive work in creating and developing the RASU. Its first phase called for automated information interaction between planning development work performed by industrial ASU's [automated control systems] and individual subsystems of the republic's Gosplan ASPR [automated system for planning calculations].

In December 1979 the interdepartmental commission of the USSR State Committee for Science and Technology approved the first phase of the Uzbek SSR RASU.

However, in the commission's act it was indicated that only the first step had been made along the path of uniting the ASU's of ministries and departments with the Gosplan ASPR and attention was turned to a number of unsolved problems.

The general director of the Uzbekistan Academy of Sciences "Kibernetika" [Cybernetics] UzNPO [Uzbek Scientific Production Association], Uzbek SSR Academy of Sciences Academician V.K. Kabulov, at the regular meeting of the Republic Interdepartmental Council on Questions of Improving Control in the National Economy, reported on how they are to be solved and on measures relating to the introduction of the first phase of the RASU and to its further development.

The problem "Automated Control of Observance of the State Pricing Discipline in the Republic's Trade System" is now being solved on line at the Uzbek SSR Gosplan IVTs [Data Processing and Computing Center] on the basis of input data in the form of test cards and cards for taking into account measures taken, which are filled in by commissions of the State Price Inspectorate. The state committee did this job before, too, but 70 days were spent on it by the manual method, which amounted to 12,200 rubles. With the automated method the time required has been reduced to seven days and the cost to 1200 rubles.

Analysis of the cost and profitability of and of prices for construction materials for 23 kinds of nonmetalliferous materials took 74 working days with traditional methods of calculation, which in terms of money amounted to 13,300 rubles. The computer solves this problem in slightly more than three days and this costs a total of 600 rubles.

In fulfillment of the decree of the CPSU Central Committee and USSR Council of Ministers titled "On the Improvement of Planning and Strengthening the Influence of the Economic Machinery on Improving Production Efficiency and Work Quality," the Uzbek SSR State Committee for Prices in conjunction with the republic's Gosplan IVTs has introduced the calculation on the computer of the problem of planning the standard net product in Uzbekistan's building materials industry. This calculation is carried out in three variants: in terms of ministry, type of product and price range.

The solution of this problem by the manual method would require 77 days and would cost 13,700 rubles. The computer does it in one day and this job costs a total of 200 rubles.

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ARMENIAN SSR CENTRAL STATISTICAL ADMINISTRATION COMPUTING SYSTEM IMPROVEMENTS URGED

Moscow VESTNIK STATISTIKI in Russian No 6, Jun 81 pp 58-62

[Article by G. Petrosyan: "To Improve the Economic Organization Principles of the Armenian SSR Central Statistical Administration Computing System"]

[Text] The goals established by the 26th CPSU Congress in the area of accounting, statistics and the efficient utilization of computer technology have a direct relationship to the development of the USSR Central Statistical Administration (TsSU) computing system. Statistics agencies are faced with the objectives of improving work efficiency and of improving organizational forms and methods for gathering and processing accounting and statistical data, as well as the efficiency of the utilization of modern computer technology--peripheral equipment, data transmission equipment and software--and of organizing group and collective-use computing centers able to ensure the further development and improvement of the efficiency of the automated system for state statistics and to create the necessary conditions for the introduction of territorial and industrial ASU's [automated control systems].

A successful solution to all these problems doubtlessly depends on improvement of the structure and forms and methods of control of the USSR TsSU computing system and of its economic machinery, as well as on the mobilization of all internal resources and improvment of the level of the computing system of Union republics.

At the present time the computing system of the Armenian SSR TsSU is represented by 41 computing organizations including the Republic Computing Center, the Yerevan City Computing Center, three rayon (city) computing and data processing centers and 36 rayon computing and data processing stations. The organization of computing and data processing stations at state statistics inspectorate bases and at machine calculation stations in all rayons of the republic was completed in 1979. An important place in the work of the computing system has been occupied by questions relating to the mechanization of the computing and accounting work of enterprises and organizations of the national economy.

Today the computing system of the republic's TsSU does work for 1411 enterprises and organizations of various sectors of the national economy, including 655 agricultural enterprises, 116 centralized accounting departments of budget institutions and self-supporting enterprises and organizations, and 161 industrial, 81 construction, 63 transportation and more than 100 trade and other enterprises and organizations.

The Republic Computing Center, in keeping with the statistical work plan, is carrying out the introduction of complexes for the electronic processing of statistical data and their gradual conversion to YeS [Unified Series] computers. At the same time it is rendering economic data processing services to industrial, trade and motor vehicle transportation enterprises, to centralized accounting offices, to administrations of Gosstrakh [USSR Ministry of Finances Central State Insurance Administration] and to other organizations in Yerevan.

Determined work is being done in the computing system on improving production efficiency and on introducing new equipment and technology. The use of packages of applied programs for the purpose of mechanizing statistical data on M-5000 (5010) PVK's [punchcard computer complexes] has made it possible to reduce expenditures of manual labor considerably and to increase the number of analytical indicators characterizing the operations of enterprises and rayon-unit organizations. The subject areas of work done are also being expanded and the overall mechanization of accounting for kolkhozes, sovkhozes, consumer cooperative enterprises and centralized accounting offices is being introduced.

Meanwhile it must be mentioned that the amount of statistical reporting processing on computers is still inadequate. One-time reports on forms No 8-nt and No 7-nt, a semiannual report on form No 11-nt, monthly reports on form No 2-ks Urgent, No 1-ks Urgent and No 1-ks By Mail (quarterly) and No 10-ks By Mail (quarterly), monthly reports on forms No 24-skh, No 15-t, No 6-mekh, etc., have been processed on computers up to this time. For this purpose it would obviously be reasonable to utilize the capabilities of the Department for Programming Statistical Problems. In addition, departments of the RVTs [Republic Computing Center] and branch departments of the TsSU in our opinion have not been closely involved in questions relating to the mechanization of statistical work. Work is also going badly on the mechanization of statistical data in rayons, too, where bookkeeping machines of the "Askota-170/55" type are being used chiefly, whose performance capabilities for performing this work are inadequately effective.

Of the 41 computing organizations of the Armenian SSR TsSU 23 are supplied only with keyboard computers. Of course, under modern conditions many accounting and statistics jobs are impossible or unfeasible to mechanize by means of this equipment.

There are also unsolved problems relating to the establishment of norms and estimates. The existing norm-setting documents do not completely make possible a solution to problems of quality and of improving statistical and accounting data. In our opinion they inadequately provide organizations with incentives to achieve ultimate work results.

The forms and methods used to provide computing system personnel with incentives also do not fully meet the requirements of today. Managerial and engineering and technical personnel and computing center and station administrative personnel, according to the standard regulation, are rewarded for fulfillment of the quarterly plan and job list within the established deadline, for not exceeding the planned cost of jobs, etc. When these conditions are fulfilled the bonus is awarded from and within the saving limits of the wage fund account. The working practice of organizations of the republic's TsSU computing system has demonstrated for several years that the personnel of many stations and centers have been deprived of opportunities for material incentives because of the lack of a wage fund saving, which can be formed mainly from underutilization of personnel strength. As a rule the computing organizations covered by this regulation have not been allotted an appropriate fund for incentives which they could use upon fulfillment of the established indicators. The situation worsened considerably with the reduction of the wage scaling factor from 0.9 to 0.6. Only the wages of production personnel have been taken into account in scaling the planned wage fund for computing system organizations, which not only deprives the team of material incentives, but also does not stimulate it to use its available resources for increasing work volume or for overfulfilling plan quotas.

An incentive problem of no small importance is the principle of the formation of the fund for enterprises. According to the instructions a deduction of one percent from the planned profit and of 15 percent from the above-plan profit has been established to go into this fund. This system of creating a fund does not interest computing organizations in taking on strenuous plans and accordingly gaining a planned profit; on the contrary, they strive to take on a low work volume quota and to gain an above-plan profit on account of overfulfilling it and to deduct 15 percent from this profit.

Questions of improving efficiency and quality have taken on special urgency in the job of rendering services to computing organizations. The existing forms and methods of handling accounts with customers, regulated in the standard contract, do not exert an effective influence.

Firstly, the efficiency of the work of computing organizations should be evaluated in terms of quality and lowering of the cost of services rendered and precisely these data together with other technical and economic indicators should form the basis of the criteria for evaluating and encouraging the work of teams. However, a reduction in the cost of services is not taken into account and indicators of the quality of work performed are not reflected in the individual documents certified by the customer and performer of the work.

An important problem also is the elimination of station redundancy. Various methods have been suggested for solving this. One of these is the creation of regional computing centers uniting several low-capacity stations, and another is the unification of stations with an oblast computing center and the reorganization of rayon stations into departments of an oblast computing center. Meanwhile, an analysis of indicators for one region of the republic which includes six stations and one center has demonstrated that problems of eliminating redundancy cannot be solved by uniting several computing organizations whereby only the number of redundant stations is reduced but this, as a rule, does not have a positive influence on the results of their work.

The precisely planned and coordinated work of the Armenian branch of VGPTI [All-Union State Planning Technology Institute], the USSR TsSU Soyuzschettekhnika [expansion unknown] Yerevan Computing Equipment Repair Plant and the Armenian SSR TsSU Educational Combine for Personnel Training (UPK) has been of great importance for improving the efficiency of the computing system.

The Armenian TsSU Educational Combine for Personnel Training is primarily to train specialists for the republic's TsSU system. This is an educational institution in which specialists are to undergo special training in the maintenance and servicing of computer equipment. However, in planning the contingent of students the demand of the republic's TsSU system and of the national economy for these specialists has not been adequately taken into account. Of the two million specialists trained annually by the republic's TsSU UPK system not one is trained in servicing computing equipment. The educational combine mainly trains accounting personnel. The shortage of specialists in the area of the servicing and maintenance of computing equipment has resulted in the fact that the TsSU system and computing organizations of the republic's socialist economy have been forced, first, to train personnel beyond the republic's borders, which involves great expense and is not always possible, and, second, to be involved in training personnel in these specialties on the job by their own manpower. All this could be avoided if the training combine constantly provided for the demand of the Armenian TsSU system for mechanized accounting personnel.

The Armenian branch of VGPTI does only 15 percent of its total work volume for the TsSU system. A number of departments of the branch either do not work according to character or do not completely perform the functions provided for by their structure.

It should also be mentioned that local financial agencies, which have been called upon to do the job of improving economic data and introducing new progressive forms of accounting, do not render sufficient assistance for realizing these goals, and the solution of these problems is worked on by statistical agencies using modern computing equipment and communications facilities.

A number of measures are being carried out for the purpose of eliminating these disadvantages and of utilizing available resources in the Armenian SSR TsSU computing system. The materials and equipment base of the Armenian SSR TsSU RVTs has been strengthened. For the purpose of ensuring the stable operation of computers and of honoring deadlines for the presentation of statistical reports, the RVTs has been furnished with completion equipment, a unit for the preparation of data on magnetic tape and three VPM [peripheral computer] units, and "Robotron-1373" machines for preparing data media, which simultaneously enable an arithmetic and logical check of input data.

Work is under way, relating to the range of clients and expanding the list of problems which can be solved for enterprises and organizations of the national economy.

For the purpose of improving the mechanization of statistical and accounting data, at the rayon and city level current and longterm plans have been developed according to which development trends for the system have been defined, including supplying it with modern computer equipment.

Computing centers have been organized at the present time on the basis of three rayon (city) machine accounting and computing and data processing stations of the TsSU system furnished with VPM's, and two more computing centers are to be set up before the end of 1981. Seven stations have been furnished with "Robotron-1720" machines; in addition, three more stations will receive these machines in the current year. In setting up computing centers and in distributing "Robotron-1720" machines the ability to ensure utilization and profitability of the work is taken into account first of all.

Determined work has been done on increasing the number of enterprises and organizations served and the amount of work performed. In 1980-1981 combined agreements have been signed with many ministries and departments and plans and measures have been called for for the development of mechanization and the introduction of progressive forms of accounting at subdepartmental enterprises and organizations.

In spite of great difficulties in introducing the total mechanization of accounting in agricultural enterprises, it has been introduced to the full extent on six farms in four rayons of the republic and the first phase of the project has been introduced at 10 farms. Preparatory work has been begun on introducing the total mechanization of accounting employing M-5000 PVK's in Araratskiy Rayon.

Work is being done to improve the mechanized processing of accounting documentation for consumer cooperative enterprises. The total mechanization of accounting has been introduced in five enterprises and at 20 bases and enterprises only stock accounting has been mechanized. An important measure in the job of organizing work relating to the introduction of total mechanization is the creation at computing centers and MSS's [machine accounting stations] of groups for the mechanization of the accounting operations of consumer cooperative enterprises and the outfitting of them with skilled specialists having a higher and secondary special education.

Work has been done on improving the mechanization of accounting with the assistance of managerial personnel of the ministries of education and public health. The introduction of the total mechanization of accounting has been begun at 10 centralized accounting offices using computers.

On the other hand let us mention several unsolved problems which cannot be solved only by the manpower of GUVR [Central Administration for Computing Operations] and the republic's TsSU. In our opinion it would be more advisable and more effective to create within the machinery of the republic's Central Statistical Administration a department of methodology and mechanization of statistical information (without increasing the number of personnel) and to assign this department the problems of formulating overall and local objectives. It would be more energetic to implement a unified longterm technical policy for the retooling of the TsSU's computing network with modern unified equipment adapted for the mechanization and automation of statistical and accounting work at various levels.

It is necessary to revise the stipulations provided by standard contracts for handling customer accounts. It is desirable to include indicators of quality and of the observance of work completion deadlines in the document for the receipt-delivery of completed work.

It would be advisable to consider the question of introducing structural changes in such organizations as GUVR, the VGPTI branch, the USSR TsSU Soyuzschettekhnika Computing Equipment Repair Plant and the republic's TsSU UPK, having a direct relation to improving the operating efficiency of statistical agencies, taking into account the provision of customers with the entire combination of services enumerated.

We also consider it necessary, in conjunction with Union ministries and departments and the USSR Ministry of Finances, to discuss the question of changing the structure of the control machinery having a direct relationship to mechanization within the limits of the personnel strength of these services (on account of relieved personnel resulting from the introduction of mechanization), to create departments (services) within the structure of individual organizations, or to assign responsible personnel (specialists) for the management of work relating to improving economic information and the introduction of advanced forms of processing it.

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MECHANIZED RECORD KEEPING OF INSURANCE INFORMATION

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[Article by N.F. Khabashesku, director, Moldavian SSR Central State Insurance Administration: "Organization of Work Relating to Introduction of Mechanized Record Keeping of Insurance Data"]

[Text] The steadfast growth in the USSR's economy and the material well-being of workers has been responsible for the extensive development of State insurance, both for the country as a whole and in our republic.

Whereas at the beginning of the Ninth Five-Year Plan period the number of life insurance contracts equaled 490,000, by the end of the 10th it equaled about 700,000.

The management of this amount of business requires considerable input of time and manual labor, which can be reduced only by using computer technology. Colossal opportunities for improving the control system reside in computers. On the other hand electronics require improvement of the level of thinking and clerical work and responsibility on the part of each insurance worker for the task entrusted him. The introduction and operation of an insurance data computer processing project are not a short-term campaign but a daily task requiring constant attention. The mechanization of insurance data record keeping disciplines insurance workers and improves the level of services to the insured.

At the present time 47 percent of all existing life insurance contracts in 15 inspectorates of the Moldavian SSR State Insurance Administration are being processed on "Minsk-22" and "Minsk-32" computers. The use of computers in the work of State Insurance Administration inspectorates has sped up and facilitated the performance of record keeping work and has improved both labor productivity and the quality of record keeping. Services to policy holders have been improved. For example, calculations for the payment of redemption sums on life insurance contracts (combined insurance, dependent-child insurance and insurance for marriage) are performed in three or four days when using computers, and even faster in urgent cases. Inventorying 50,000 active life insurance contracts by means of a computer is accomplished in two hours, and not in a month as with manual processing.

With the processing of insurance data on computers the amount of errors in the payment of insurance and redemption sums and in recording the receipt of insurance premiums on a personal account has been reduced. Automation has sped up the issuance of records for the deduction of insurance premiums from the wages of insurance policy holders, making it possible to free the time of insurance agents for concluding and renewing policies. It is possible to check the status of any personal account as of a specific date from computer printouts.

As demonstrated by experience, in solving problems relating to doing away with obsolete methods of working organizational factors are very important. It is necessary clearly to explain the essence of measures, to prove their economic advantage, and to win people over, and serious training of the team is required. The Moldavian SSR Central State Insurance Administration Division of Mechanization and Computing Operations organized republic seminars, as well as hands-on instruction in the mechanization of insurance data record keeping and the filling in of input documentation. However, success in the introduction of a computer processing system depends not only on insurance personnel but also on computing center personnel. High-quality information can be obtained in good time only with a combined effort.

The processing of insurance documents on computers has been established best of all in the republic in the State Insurance Administration inspectorate in the city of Bendery (number of personal accounts--36,330). The processing of documents has been performed by the machine method for more than seven years here and the inspectorate's personnel cannot even imagine how it would be possible to do without a computer.

In keeping with the current project, the following are performed on a "Minsk-22" computer for the Bendery State Insurance Administration inspectorate:

The entry on life insurance policies of premiums for personal accounts received from policy holders.

Reduction of insurance amounts.

Calculation of insurance amounts in connection with termination of the term of a policy.

Calculation of redemption sums for valid and expired life insurance policies paid off in payments over not less than six months.

Calculation of insurance amount in connection with the death of a policy holder or insured.

Recalculation of premiums with a change in the size of a monthly premium in connection with an accident.

Transfer of policies from agent to agent in another inspectorate.

Renewal of policies which have run out.

Writing of statements of personal accounts.

Writing of organization lists with the non-cash-settlement payment of life insurance premiums.

The keeping of a journal for recording policies, premiums and insurance amounts for life insurance, form No 185.

The keeping of a journal for records of voluntary social insurance policies, form No 164.

The writing of inventory lists for life insurance and dependent-child insurance policies terminated at definite time periods (by year).

With the conversion to the machine processing of documents in the Bendery State Insurance Administration inspectorate the manual performance of the following has been eliminated:

Of keeping personal accounts, form No 11, and the writing of statements for personal accounts.

The writing of lists for organizations in the non-cash-settlement payment of life insurance premiums.

The making of calculations, form No 194-a, for the payment of insurance sums in connection with the termination of the term of a policy, the death of a policy holder (insured) and the payment of redemption sums.

The keeping of a journal for recording the number of policies, premiums and insurance amounts for life insurance, form No 185.

The keeping of a journal for recording voluntary social insurance policies, form No 164.

As the experience of introducing the machine processing of insurance data in the Bendery State Insurance Administration inspectorate has demonstrated, where accuracy is observed in the filling in of primary documents and their orderly receipt at the computing center is ensured (according to schedule), and errors are adjusted in good time, the changeover to computers is accomplished without any particular added input of work time.

The use of computers has considerably facilitated the work, has freed time for controlling and checking documents and has made it possible to achieve maximum reliability of accounting and reporting data and to improve accounting efficiency. The conversion of inspectorates to the mechanized processing of insurance data is a subject of concern not only for the division of mechanization and computing operations, but also for the personal insurance division, the bookkeeping department and the economic planning division.

The coordination plan for a system for controlling the USSR State Insurance System, the "ASU-Gosstrakh," for 1980-1986, approved by the USSR Ministry of Finance, has called for the creation of a unified automated system for controlling the State insurance system, making possible the management of insurance operations at the union, republic, oblast and rayon levels.

The computing and data processing center of the Moldavian SSR Ministry of Finance processes the data of 12 inspectorates of the State Insurance Administration (265,026 personal accounts) on a "Minsk-32" computer in keeping with the Gomel' plan for the electronic processing of insurance data (edition 6-A). The process is carried out according to a schedule prepared and approved beforehand.

At the present time a new data processing and computing center building is being constructed in which two computers will be installed--a "Minsk-32" and YeS-1033--and with the entry of this building into service (in 1981) the data processing and computing center of the Moldavian SSR Ministry of Finance will be able to receive for processing the insurance data of three more inspectorates and with time the "Minsk-32" computer will be able to process only the work of the State Insurance Administration, which will shorten to an even greater degree the time for processing insurance data and the State Insurance Administration's inspectorates will receive output documentation earlier.

The Moldavian SSR Central Statistical Administration Central Data Processing and Computing Center in Bendery is processing insurance information for two inspectorates of the State Insurance Administration (46,859 personal accounts) on a "Minsk-22" computer. The "Moldpishcheprom" [Moldavian Food Industry] ASU computing center in Kalarash is processing data for one inspectorate of the State Insurance Administration (10,600 personal accounts) on a "Minsk-32" computer. The Moldavian SSR Central Statistical Administration Central Data Processing and Computing Center in Bendery has made possible the higher-quality processing of insurance information.

In connection with the introduction in the country of a new project for the machine processing of insurance data employing PVK's [punchcard computer complexes] of the M-5000 type, further development of mechanized accounting in the Moldavian SSR will be accomplished also by means of these computers.

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COMPUTING CENTER DATA SHEET PROPOSED

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[Article by V. Klimenko and F. Furman: "Regarding a Computing Center Data Sheet"]

[Text] Problems of improving the efficiency of the utilization of computer technology facilities in computing and computing and data processing centers (VTs's and IVTs's) have taken on ever greater importance with each year. The solution of these problems is associated to a great extent with the obtainment of a complex source of information for an extended statistical economic analysis and improvement of the planning of the production and business operations of a VTs (IVTs). Such a source of information will create real conditions for estimating the potential possibilities of improving the utilization of the production capacities and other resources of the center.

At the present time data on various aspects of the operation of computing centers are grouped on their bookkeeping and statistical reporting forms. These data characterize the presence and utilization in the reporting period of the equipment base of the computing center, of labor, material and financial resources, and other aspects of the center's operations. However, the existing principles of systematizing the operating indicators of computing centers on reporting forms, the diversity of indicators on one and the same form which not infrequently differ in their economic content, and occasionally the duplication of identical indicators on various forms create certain difficulties in employing the reporting of computing centers (IVTs's) for the needs of statistical economic analysis and for production economics planning.

No small role is played by certain difficulties associated with the structure of dynamic series of indicators of the production economics of a computing center, which has a negative effect on the technical and economic substantiation of yearly and five-year plans developed and on the possibilities for making an economic analysis in the computing system.

In connection with this statistical agencies have been confronted with the problem of developing a VTs (IVTs) data sheet on which all key indicators of the production economics of a computing center would be represented, which are necessary for an extended statistical economic analysis and for the development of annual and five-year plans. The data sheet was developed by the USSR Central Statistical Administration (TsSU) Scientific Research Institute in conjunction with the USSR TsSU

Central Administration for Computing Operations and has been approved at 40 VTs's (IVTs's) for all levels of state statistics.

The data sheet consists of a set of forms (tables), each of which characterizes some aspect of the operations of the computing center in the year under review. For example, one table characterizes the problems solved at the computing center, another the presence and utilization of computer technology and data transmission and teleprocessing facilities, and the third the utilization of material resources and the like. All data entered on the data sheet's forms have a documented basis, i.e., correspond to plan data and to bookkeeping and statistical reporting, and in a number of cases also to primary accounting documentation data.

In keeping with the order of the USSR Central Statistical Administration which approved the data sheet, one will be written at each computing (computing and data processing) center of the system. Subsequently the intent is to refine the data sheet's indicators annually. At newly created computing centers the intent is to develop a data sheet simultaneously with their organization. For the purpose of reducing the labor intensiveness of filling in and using the data sheet, its data will be stored on machine media in the form of a specialized data base and will be issued to users in the form of computer printouts. On the basis of the data sheet's data, the creation of an automated information-reference system (automated register of computing centers) is planned.

Let us discuss briefly the structure and content of a VTs (IVTs) data sheet.

All of the data sheet's indicators can be arbitrarily divided into the following main groups: the existence and utilization of production capacities; organization-technical level of automated and mechanized data processing; quality and timeliness of computer work performed; and technical and economic indicators necessary for the development of annual (five-year) plans and for controlling the USSR Central Statistical Administration's computing network. All these groups of indicators are systematized in six sections of the data sheet: production capacity of the VTs (IVTs) and its utilization; volume of computing work performed; fixed capital; material resources; labor resources and social development; financial indicators.

The mean annual production capacity of a VTs (IVTs) is expressed on the data sheet by an indicator of the utilization of computer technology facilities (for computers, PVM's [punchcard computers] and KVM's [keyboard computers] individually). The capacity for the processing of data on an electronic computer is determined in machine-hours and the norm mean annual utilization of an electronic computer is established as a function of its type. The capacity for processing on a PVM and KVM is indicated in rated output per man-hour and is expressed by means of an indicator of the norm mean 24-hour utilization of tabulators and bookkeeping and billing machines. Conventionally in estimates it is assumed to equal 12 hours regardless of the actual shift factor for the equipment's operation. The amount of work actually performed (in thousands of printed sheets) is indicated for copying and duplicating. Utilization of the mean annual production capacity is expressed by means of an indicator for comparing the norm and actual capacity for kinds of computer technology facilities.

Form No 1, "Reporting Fulfillment of the Production Quota" (annual), section II, "Presence and Utilization of Computer Equipment," and the reference to section I, "Amount of Work in Full-Scale Units of Measurement," serve as the source of information for obtaining data characterizing on the data sheet the production capacity of the computing center and its utilization.

The utilization in the year under review of the equipment base of the computing center (computer technology facilities, data transmission and teleprocessing equipment, as well as copying and duplicating equipment) is characterized by an indicator of the mean annual utilization of a single list-average machine (in terms of plan and actually). For equipment for which this indicator is planned, a determination is also made of the percentage of fulfillment of the plan for its utilization computed as the ratio of the actual values of the mean 24-hour utilization indicator to the planned (for all kinds of computing equipment present).

Special attention on the data sheet is devoted to a characterization of the utilization of computers. Indicators are provided for the duration of the entry of each machine into service (in terms of norm and actually), and for their mean 24-hour utilization during the period of mastery in steps (according to the norm and actually). Indicators have been added which characterize the supply kit for each computer and additional equipment.

The volume of work performed and of computing center services is indicated on the data sheet not only in terms of wholesale cost, but also of full-scale units of measurement. Considered the main kinds of work and services of a computing center are the processing of information on electronic computers, PVM's and KVM's, copying and duplicating, the preparation and output of data, and the preparation of algorithms and programs. Work performed by on-line printing subdivisions is also to be included in the amount of copying and duplicating work.

A separate form of the data sheet characterizes the specialization of computing center work and services. The following are presented on it separately in terms of the statistical work and services rendered to enterprises, organizations and institutions of the national economy: number of enterprises, institutions and organizations reported on or the number of customers served; amount of work (services) performed--for the plan as a whole and actually including for computers, PVM's and KVM's individually; and the percentage of work (services) of the total amount, for types of computers, too.

The labor intensiveness of work and services performed by the computing center is represented in a separate table of the data sheet in terms of types of computing equipment (computers, PVM's and KVM's), as well as in terms of the preparation and output of data and the preparation of algorithms and programs. This table is filled in from accounting data on the labor intensiveness of work for accounts with customers. The table is filled in on the basis of the procedure for accounts with customers in effect at the computing center for those type of machines for which there is no accounting for the labor intensiveness of work.

Great attention is paid on the data sheet to the quality of work and services performed, as well as to the timeliness of the presentation of output data to customers. Indicators of the quality, reliability and timeliness of the presentation of statistical work, as well as of work performed for enterprises, organizations and institutions of the national economy, testify to the quality of the work of the computing center itself.

The data sheet also provides for the possibility of expanding the structure of work and services performed by the computing center and the necessity of carrying out accounting for them. A form which contains a list and the amount of computing work first mastered at the computing center is filled in from data for the performance of the "statistical work plan" according to contracts concluded with the customer, as well as for other work. Indicated on it are the names of jobs associated with the approval and experimental introduction of electronic data processing complexes, individual statistical and accounting work, work relating to ABD's [automated data banks], VTsKP's [collective-use computing centers], registers, the STOSI [statistical data teleprocessing system], one-time jobs, improvement of the mechanization of accounting for enterprises and organizations of the national economy, etc. Work received only during the year under review is included on the form. Work done and associated with the modernization of technological equipment, as well as the introduction of efficiency experts' suggestions for its improvement, are thereby not taken into account.

The amount of data processed at a computing center, relating to statistical work and services for enterprises and organizations of the national economy, is indicated on the data sheet by type of computing equipment: electronic computers, PVM's, KVM's and billing and bookkeeping machines. The total amount of information processed includes input, output and conventionally permanent data. By the latter are meant norm-setting, estimation, reference, and the like data used in processing input information. The following are used as the units of measurement of the amount of information processed: for computers--thousands of alphanumeric characters; for PVM's--thousands of punched cards; for KVM's--thousands of operations; for billing machines--thousands of documents; and for bookkeeping machines--thousands of lines.

The fixed capital of a computing center is characterized by the indicators of two forms of the data sheet. On the first is given the mean annual cost of individual groups of the fixed capital of a computing center and their presence at the end of the year, and on the second indicators of the presence and movement of technological equipment in terms of individual kinds, for the entire list of computing and data transmission and teleprocessing facilities, as well as for offset printers, motor transportation, air conditioners, stabilizers and other equipment. Serving as these indicators are the presence of equipment at the beginning of the year, its arrival and departure, with reasons, and its presence at the end of the year.

For a characterization of the consumption of material resources in the year under review, indicators for their consumption according to plan and actually are employed. The list of material resources includes a list of kinds of paper and cardboard used at the computing center, punched cards and punched tape by size, magnetic tape, and electric power. In addition, the total consumption of materials associated with data processing is presented in a table; a calculation is made of the cost of materials per ruble of the amount of computing work in terms of wholesale cost. Indicators for the utilization of the list of material resources presented in the table (with the exception of electric power) are calculated in full-scale units of measurement (thousands of pieces, kg and km). Established norms and standards for the consumption of material resources, in particular, of individual kinds of paper, cardboard and punched tape, are still lacking at VTs's (IVTs's) at the present time. This does not make it possible to calculate plan indicators for the consumption of material resources and thereby to control the actual consumption of materials.

An important place is set aside on the data sheet for indicators of the presence and utilization of the computing center's labor resources. On one form of the data sheet is presented the list-average number of personnel--the total including by individual categories--the number of personnel at the end of the year and its wage fund (total and by individual category). In addition are calculated the worker turnover ratio and the monthly average wages of a single operator.

Labor productivity and the utilization of machine time are characterized on another form next to indicators. These include the growth in labor productivity, output per operator, average percentage of fulfillment of output norms by operators, losses of operator work time for various reasons, work on days off and holidays (unscheduled), etc.

After the conversion of computing centers to the new system of planning and economic incentives, a data sheet form is to be filled in which includes indicators of the social development of the computing center, such as the size of the material incentive fund (paid) per single worker, the size of the social and cultural measures fund (paid) per single worker, etc.

For a characterization of the work of the computing center as a whole, plan and actual indicators of the balance profit (deficit), represented on the data sheet, are employed--the total, including from the accomplishment of computing work and services, and expenditures per ruble of the amount of work performed in terms of wholesale cost.

The forms of the data sheet are filled in and individual indicators are calculated according to the existing norm-setting documents for planning and accounting in the computing system of the USSR Central Statistical Administration. References to the corresponding norm-setting documents and sources of planning and accounting data are given in the instructions for the processing of each form of the data sheet.

The improvement of economic work in the computing system, the development to the full extent of norms and standards for the utilization of VTs (IVTs) resources, and the entry into effect of new norm-setting documents, of primary accounting documentation and reporting forms will exert a definite influence on the content of a data sheet. Therefore provision has been made for the possibility of updating the forms of a computing (computing and data processing) center's data sheet.

The introduction of the data sheet into computing center practice will exert a positive influence on the ordering of economic work and will create the necessary conditions for the revelation of intraproduction potential, which is especially important under conditions of the forthcoming conversion of computing centers (computing and data processing centers) to the new system of planning and economic incentives.

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MILITARY INSTRUCTION ON COMPUTER COMPONENTS

Moscow TEKHNIKA I VOORUZHENIYE in Russian No 6, Jun 81 pp 18-19

[Article by Engineer Colonel A. Meteshkin, doctor of engineering science and professor, and Engineer Colonel A. Mokrinskiy, candidate of engineering science and assistant professor, under the rubric "In Military Training Institutions": "Studying Digital Computers"]

[Text] Many years of experience in teaching computer equipment in the Military Engineer Radio-Engineering Academy of the PVO [Air Defense] have shown that it is advisable to begin the study of computers with an analysis of the logic structure of the machine and problems solved by it, basic technical characteristics and the formats of instructions and numbers.

Already in the first stage of familiarization with the computer, it is necessary to discuss in detail the system and general principles of instruction execution in the machine and the organization of its operating cycle. Practice shows that profound knowledge of the fundamentals of computer functioning in executing program instructions is important to understanding the structure of any computer and predetermines the effectiveness of the entire training process. Of great value in the process is the mastery by the students of programming concepts such as instruction, instruction address, operand address, operation code and others.

After the familiarization stage, the element base of the computer is studied. This sequence is no coincidence: After all, the logic structure of a computer to a certain extent depends on the type of integrated microcircuits (IMS) with which the computer is built.

The technique of studying microcircuits has its own features. As a rule, there are several dozens of integrated microcircuits even in one series and it is practically impossible to immediately master all of them in the allotted time. Therefore, we discuss in detail with the students only those integrated circuits that realize the basic logic functions: AND, OR, NOT AND and NOT OR and the storage element functions. Tests show that the knowledge of the structure of these microcircuits is sufficient for independent mastery of the more complex circuits and standard exchange cards. After the study of microcircuits, the students are familiarized with the peculiarities of using them as the base to build digital converters of information: adders, counters, decoders and registers.

After mastering the computer element base, the students begin detailed study of the basic machine devices. They are first given a class on the principles of data processing in computers to give them a clear understanding of how computer devices operate in executing the different operations. It is pointed out that this processing is the automatic execution of a specific sequence of operations on numbers (data), and each operation in turn is a sequence of elementary actions or microoperations. Their ordered set forms a microprogram of operations.

The microprograms are executed in the computer devices. In the process of their realization, the individual assemblies of the device play a different role. Therefore, it is advisable to present each device in the form of two automata: control automaton A and operation automaton B. Automaton A controls the course of realization of the various operations, while automaton B receives, stores and processes data, i.e. executes the microprogram of operations. Representation of any machine device in the form of two automata, A and B, is subsequently used extensively.

The preliminary familiarization with the organization of data processing creates the unified methodological prerequisites for studying all computer devices on the basis of microprograms. As practice shows, this promotes raising the effectiveness and quality of student training and reduces the time for mastering the computer as a whole.

Successful study of the computer also depends on the order adopted for going over its devices. It has been established that the highest stringency in mastering computer architecture is achieved when the students first study main and permanent storage, then the processor and selector and multiplex channels, and then peripherals.

This order stems from storage devices having a relatively simple logic structure and being able to be studied rather completely without deep knowledge of the other computer devices.

The structure of main and permanent storage devices is defined largely by the adopted methods of writing, reading and selection of data, features of accumulation, and by the nature of design measures used to enhance the reliability and speed of their operation. Therefore, after familiarization with the composition of any of these storage devices, we discuss how the processes listed above have been realized in them. This makes it possible to clearly explain the functions performed by the assemblies and units of the device, and to knowledgeably move on to analyzing the operation of its operation automaton B in accordance with microprogram writing and reading of data.

The processor, as is known, is the central and most complex part of the machine. In the processor itself, we study in sequence the arithmetic logic unit, the fast access storage unit and the control unit. And in the first stage, the control unit is discussed only to the extent necessary to understand the functioning of the processor and all types of computer storage. We cover this unit fully after a detailed study of the organization of input-output and the structure of the selector and multiplex channels.

In studying the arithmetic logic unit of the processor, the instructor has to explain to the students that its structure is decisively affected by such operations as addition, subtraction, multiplication and division. Therefore, it is advisable

Great experience in the study of computers has been gained at the Military Engineer Radio-Engineering Academy of the PVO [Air Defense]. Academy students are successfully applying the knowledge they obtained in scientific military work and in preparation of a course and diploma design project.

Shown in the photograph are academy students, captains V. Sychev (sitting) and N. Kucherenko, familiarizing themselves with the operation of an alphanumeric display.

to begin the study of this unit with an analysis of the algorithms and microprograms of these operations. Experience shows that profound knowledge of the algorithms and microprograms of the four arithmetic operations as well as the structure of the automata A and B corresponding to them in principle is sufficient for rapid and successful mastery of the structure and functioning of the arithmetic-logic unit in executing all other operations. The methodological sequence of presentation of the material in the process remains uniform. First, the algorithm of the operation in question is covered and the structure of the operation automaton B that realizes it is analyzed; then the microprogram for the operation and the performance of this same automaton B in executing it is studied. Finally, the structure of the control automaton A is analyzed.

The method of studying the fast-access storage unit included in a processor is similar to the method for studying main and permanent storage devices that was discussed above.

The technique for studying the processor control unit has important features. To a considerable extent, the functions and logic structure of this unit are determined by the computer instruction set and methods adopted for data addressing, organization of the machine operating cycle and other factors. Therefore, we begin the study of the processor control unit with a discussion of these questions and the organization of instruction execution in the machine.

The control unit structure is studied in depth in an analysis of its functioning in the natural order of instruction execution (when program instructions are executed in numerical sequence), in transfer of control and in execution of cycles and address changes.

It should be kept in mind that a computer operational cycle can be divided into two steps: the step of preparation and the step of execution of the operation.

In the step of preparation of any operation, the machine executes, as a rule, a limited number of different microprograms. And the nature and number of these microprograms does not depend on the type of operations, i.e. on whether the machine is adding, multiplying, dividing etc., but are determined by the methods of address change, data addressing and storage of instructions and operands adopted in the machine.

This is why we first study the functioning of the control unit in executing the limited set of microprograms for the preparation steps and then concentrate just on the microprograms for the steps of executing operations. It is easy to understand that this method precludes any duplication of material and reduces training time.

Modern computers, as is known, execute a large number of different operations (instructions). Therefore, it is exceptionally difficult to study the microprograms for the steps of execution of all operations in the training hours. However, the processes of executing many machine operations differ from each other only by the presence of individual, specific microoperations. This circumstance makes it possible to analyze in detail the operation of the control unit by the microprogram for the step of executing a characteristic operation, for example, addition, and then to consider just the specific microoperations of all other microprograms. It is difficult to overestimate the value of the latter factor in intensifying the study of the control unit.

During program execution, the processor control unit organizes interaction of all computer components in time. Therefore, when studying it, we make extensive use of time diagrams that provide a graphic view of the dynamics of operation of the computer as a whole.

The methods for studying the data input-output channels are basically similar to those we have discussed. The students are first familiarized with the so-called input-output interface, i. e. with the system of rules prescribing the interaction between the channels and the processor, main storage and peripherals. Then studied in detail are the input-output instructions, channel control words and channel programs. All this creates the necessary conditions for studying first the elector, and then the multiplexer channel. In the sessions on the multiplexer channel, we discuss in detail the organization of subchannels and interrupts of channel input-output programs.

The study of the physical parts of the computer basically ends with an analysis of those features of the processor control unit that are snaped by the data input-output methods realized in it.

As for the methods of studying the peripherals (perforators, plotters, displays and others), they are similar to those used for ordinary electromechanical devices. Practice shows that studying peripherals presents no special difficulties. Therefore, as a rule, they are discussed by the students in practical sessions independently.

This technique has made it possible to raise the effectiveness and quality of training students on the physical parts of the computer. Its basic provisions are used in the academy also in studying the digital devices in radio-electronic systems.

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BRIEFS

ROBOT 'EAR' MODEL--Machines are still not able to see, hear and feel, and in the control system of a robot there are still no parts which simulate human sense organs. And all the same, let us state, a dialog certainly does take place between a robot and a human. Research conducted at the USSR Academy of Sciences Institute of Physiology imeni I.P. Pavlov inspires this confidence. The laboratories of physiology and the biophysics of speech, directed by doctors of biological sciences Lyudmila Andreyevna Chistovich and Valeriy Aleksandrovich Kozhevnikov, are working on the problem of the automatic recognition of speech. It was explained to me that the unit consisting of several electronic devices and an interweaving of wires is an analog, a model of the human ear. The devices reproduce the processes taking place in the main organ of the peripheral auditory system--the inner ear. When a word is uttered into the microphone the electronic model processes it and records it on photographic paper in the form of dark and light bands, sections of crowding and spacing out. The photographic recording reflects the pattern of excitation in the auditory nerve which is caused by sound waves in the utterance of a word. This research has united physiologists, mathematicians, engineers and linguists. And French specialists--a group of associates of the Grenoble National College of Electronics and Radio Engineering headed by René Carré--in conjunction with Soviet scientists from the Institute of Physiology imeni I.P. Pavlov are conducting research on the subject of "Acoustical Dialog Between Man and Machine." [By S. Krayukhin, Leningrad] [Excerpt] [Moscow NEDELYA in Russian No 30, Jul 81 p 4] 8831

CSO: 1863/231

ORGANIZATIONS

WORKING GROUP ON PROGRAMMING TECHNOLOGY

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 pp 141-142

[Article by V.P. Breyev: "On the Working Group on Programming Technology", in the section devoted to "Symposia, Conferences and Meetings"]

[Text] The Working Group on Programming Technology (RGTP) was created on November 22nd, 1979 by a decision of the office of the Interdepartmental Scientific and Technical Commission on Computer Software of the USSR State Committee for Science and Technology (GKNT); the RGTP included the following: A.A. Stogniy (chairman), I.V. Vel'bitskiy (deputy chairman), E.Kh. Tyugu (deputy chairman), V.N. Tsoy (scientific secretary), B.A. Babayan, V.P. Breyev, V.M. Bryabrin, L.N. Korolev, V.V. Lipayev, M.Ye. Nemenman, I.V. Pottosin, A.P. Pyatibratov, L.D. Raykov, S.T. Rodionov, V.P. Semik, V.P. Tikhomirov and G.D. Chinin.

The following main tasks were put before the RGTP:

--Assisting in the development of work on programming technology (TP) in the nation as well as establishing an active membership of specialists working in this field;

--Creating an information fund of domestic literature on TP and providing for operationally timely information exchange among specialists;

--Standardizing programming technology terminology;

--Expert and comparative evaluation of various programming technologies and the determination of the overall level of programming technology in the nation.

The report "Analysis of the Status of Work on Programming Technology, Trends and Prospects for Its Development" was approved at the first session of the RGTP (March 1980, Moscow), and a draft of the coordinated plan of the GKNT on programming technology for the 11th Five-Year Plan was discussed. The status of the RGTP and the plan for the work of the group in 1980 were also approved at this same session, while the following specific subgroups were set up: terminology (chairman, M.Ye. Nemenman), planning methods (V.A. Krakht), theoretical questions (A.V. Maklakov), etc.

A definition of the concept of programming technology was given in the RGTP report, the state of the art of programming technology work was analyzed and directions for its development in our nation were planned. Facts were given in the appendix to the report which reflected the urgency of the work on programming technology, as well as a brief description of the most widespread technological methods abroad and a comparative characterization of certain domestic technological complexes and systems. For the purpose of fundamentally improving work on programming technology, it was proposed that: a coordinated program of work in the TP field be set up and incorporated in the assignment of first level national economic plans for the 11th Five-Year Plan; technological complexes for programming be included in the obligatory delivery on user orders along with the computer hardware and software; a system be created for teaching the existing technologies both in a training network and in a re-education network for personnel for the corresponding specialities; strengthen the attention devoted to programming technology literature on the part of the periodical press (the journals PROGRAMMIROVANIYE [PROGRAMMING], UPRAVLYAYUSHCHIYE SISTEMY I MASHINY [CONTROL SYSTEMS AND MACHINES], KIBERNETIKA [CYBERNETICS]) and the publishing houses "Statistika", "Nauka", "Sovetskoye Radio", etc.

The participants in the second session of the RGTP (December, 1980, Kalinin) noted that over the first year of activity the group had carried out the following major work:

--Analyzed and determined the area of application of the main domestic programming technologies;

--Participated in the preparation of GKNT decree No. 446 of 4 November 1980 "On Accelerating the Introduction of Programming Technology Complexes into the National Economy" and in setting up the first level tasking for programming technology for the 11th Five-Year Plan;

--Organized the publication of topical issues of the journals CONTROL SYSTEMS AND MACHINES (No. 1), PROGRAMMING (No. 2) and CYBERNETICS (No. 2);

--Established communications with the Committee on Programming Technology (director, V.I. Legon'kov), which includes the Interdepartmental Scientific and Technical Commission on Computer Software in the Section on Applied Program Packages (director, academician N.N. Yanenko);

--Discussed the first draft of a terminological dictionary and the conceptual tools for programming technology;

--Started work on the formation of an active RGTP membership and the appropriate information fund.

At the third session of the RGTP (February 1981, Novosibirsk), the report "Programming Technology in 1980" (the authors were R.G. Raud and E.Kh. Tyugu) was discussed and approved, the main attention in which was devoted to an analysis of the programming technology for microprocessor hardware. The report came to two main conclusions:

--At the present time, the development of microprocessor hardware programming is unfortunately taking a traditional path: just as for all-purpose computers, the stress is not being placed on technology, but rather on the programming languages, where basically universal broad applications languages are being used as the programming languages;

--The well-known difficulties and contradictions in traditional programming (the poor labor productivity of programmers, the nonindustrial nature of the work, the high cost of the work, etc.) have not been reduced in the programming of microprocessor hardware, but have become even more acute.

The following is proposed in the report to set up a domestic programming technology for microprocessors and eliminate the errors which have appeared even in the initial stages of setting it up:

1) Centralize all of the work in this field, creating the conditions for rapid communications between customers and manufacturers of programming systems and problem oriented systems of program production;

2) Standardize the programming technologies (not the languages!) for microprocessor hardware, creating the appropriate software and hardware support systems, as well as systems for automating the production of programs for microprocessors;

3) Create a unified information catalog of existing tools for the automation of the programming, planning and debugging of program systems for microprocessor hardware;

4) Do the requisite work to refine the architecture of the microprocessor hardware being created, working primarily from the need for an improved programming technology and improved operation of these units by the mass user;

5) Develop the appropriate course of lectures and procedural handbooks for training and re-educating personnel.

The intermediate result of the work of the subgroup on the special topic of generating the conceptual tools for programming technology, which was prepared by F.Ya. Dzerzhinskiy, was also discussed at this same session. Having heard the scientific paper of V.I. Karnachuk on efforts in programming technology in the Section on Applied Program Packages, the session participants noted that the trends of these works in the Section and in the RGTP coincide and approved measures to coordinate efforts and mutually exchange information. The session approved the plan for RGTP work in 1981, and also formed an address network and approved measures to expand the active membership of the RGTP.

A number of reports were heard at the fourth session of the RGTP (April, 1981, Dubna):

"The State Fund of Algorithms and Programs - Status, Prospects, Basic Conceptual Tools" (A.V. Vladytskiy);

"On the Concept of a Program Product in the Sector" and "The Status of Work and the Prospects of Creating a Unified System of Program Documentation" (Ye.N. Mal'ginov);

"Requirements Placed on the Conceptual Tools of Programming Technology for the Industrial Accompaniment of Automated Control System Software" (G.I. Kal'nish);

"Specific Features of Programming Technology at a Large Physical Center" (V.G. Ivanov);

"Some Programming Technology Concepts in the Terms of the Unified System of Technological Production Preparation and Unified System of Technological

Documentation" and "Basic Principles of Organizing and Managing the Technical Preparation of Software Developments" (A.A. Tsvetkov).

The third edition of proposals concerning the conceptual tools of programming technology prepared by F.Ya. Dzerzhinskiy and I.M. Kalinichenko was discussed. There were four main terms at the center of attention: 'programming means', 'programming technology', 'program life' and 'program documentation'; in this case, the discussion had three aspects: subject (what is it?), purpose (why?) and means (how determined?).

The functions of the subgroups for specific topics which were created earlier were made more precise at the session and new specific subgroups were also established: microprocessor programming technology (chairman, R.K. Raud), theory and methods (V.A. Krakht), the organization of the development of programming means (A.A. Tsvetkov) and the teaching of programming technology (V.G. Volkhover).

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INFORMATION SCIENCE ACCOMPLISHMENTS, GOALS SKETCHED

Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 81 p 10

[Article by V. Siforov, USSR Academy of Sciences corresponding member and director, USSR Academy of Sciences Institute of Problems of Data Transmission: "Horizons of Information Science"]

[Excerpt] At the USSR Academy of Sciences Institute of Problems of Data Transmission a number of valuable fundamental studies have been made in the area of the transmission, distribution and processing of data in physical, technical and biological systems. In particular, effective methods of coding and decoding information have been developed. At the institute has been created essentially an all-Union center for the processing of images. The effective processing of images of various photographs of objects in space, of the terrestrial surface, etc. has been carried out. The results of the research have already found extensive application in quite different sectors of the national economy, in geological practice, in prediction of the force of earthquakes, in medical practice, in criminology, art research and in a number of other areas.

Work quite extensive in terms of scale and results has been carried out in various areas of information science and practice at institutes of the USSR Academy of Sciences, in particular, at the institutes of radio engineering and electronics and control problems, in the academies of sciences of Union republics, in industrial academies, at VINITI [All-Union Institute of Scientific and Technical Information], at the Institute of Scientific Information on Social Sciences (INION), as well as in the information services of various ministries and departments and in organizations leading the development work on the creation of the country's Unified Automated Communications Network.

However, in spite of all the obvious successes, in the 11th Five-Year Plan period and in the period to follow it is necessary to solve a number of big complex problems in the area of information science and the use of its achievements in practice. It is necessary to perform work firstly on the organization and completion of applied scientific research and experimental design developments for hardware components and systems for the transmission, distribution and processing of information with the employment of results already achieved in fundamental science. Secondly, it is necessary to continue further searches for a solution to the fundamental root problems of information science, taking into account both relatively short-term and long-term trends in its development, hardware components and information systems.

One important trend in the improvement of hardware components and information transmission systems is the creation of fiber optics communication lines. In these lines information is transmitted through fine glass fibers and cables by means of rays of light emitted by miniature lasers. Calculations have demonstrated that it is possible to transmit through a single glass fiber filament 10,000 times more information than through an ordinary copper wire. When a glass fiber is used the distance between intermediate repeater stations can be brought up to dozens and even hundreds of kilometers. Several experimental fiber optics communication lines are already operating in our country in urban telephone networks in Moscow, Leningrad and Gor'kiy.

The use of glass fiber communications lines makes it possible to advance to a considerable extent the solution to the problem of the transmission of large arrays of data, that is, to satisfy considerably more fully the current public demand. At the very same time it is possible to gain a quite solid savings of scarce nonferrous metals in the fabrication of communication cables.

An enormous role belongs to the improvement of computers and their utilization in systems for transmitting, distributing and processing information. A great amount of work is being carried out along this line in the Soviet Union in conjunction with countries of the socialist community.

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PUBLICATIONS

ABSTRACTS FROM JOURNAL 'CONTROL SYSTEMS AND MACHINES', MAY-JUNE 1981

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 81 pp 145, 147, 149, 151

UDC 681.3.01.539.1

PROBLEMS OF THE DESIGN AND FUNCTIONING OF COMPLEX AUTOMATED CONTROL SYSTEMS

[Abstract of article by Skurikhin, V.I. and Morozov, A.A.]

[Text] The specific features of integrated ASU's [automated control systems] are treated. The efficiency of such systems is substantiated and approaches to obtaining the integration effect are presented. The class of complex automated automated systems (KASU) is treated as the major class of integrated ASU's, a specific feature of which is the integration of all ASU's tied in to the technological cycle for the development, fabrication and testing of a product. Figures 5, references 4.

UDC 001.57+681.31

HEURISTIC MODELING

[Abstract of article by Polozov, V.S.]

[Text] A method is described for modeling the activity in the process of solving problems which are difficult to formalize. The contents of each modeling level are analyzed and a general scheme is given. Examples are provided as well as references to the application of the technique to the preparation of planning and engineering graphics problems for solution on a computer. Figures 2; references 15.

UDC 518.5

ON THE CHOICE OF COMPUTER WORD LENGTH IN THE SOLUTION OF SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS ON A COMPUTER

[Abstract of article by Glushkov, V.M., Molchanov, I.N. and Nikolenko, L.D.]

[Text] The precision of a solution obtained with a computer is analyzed as a function of the computer word length and the properties of the system matrix. The necessity of a variable word length to obtain a solution of the requisite precision while making economical use of computer resources is substantiated. References 7.

UDC 51:681.3

SOME PROBLEMS OF INVESTIGATING THE EFFICIENCY OF THE YeS1060 COMPUTER IN A TIME SHARING MODE

[Abstract of article by Kovtun, V.Ya. and Maksimov, N.S.]

[Text] An experimental time sharing system designed around the YeS1060 computer is described. The parameters of the time sharing system which influence the characteristics of the computer system are analyzed. A procedure is proposed for studying the system characteristics for the purpose of determining its maximum efficiency. Figures 2; references 3.

UDC 658.52.011.56

SOME PROBLEMS IN THE DEVELOPMENT OF PIPELINE CONTROL IN A MICROPROGRAM COMPUTER

[Abstract of Article by Krichevskiy, B.M., Mustafayeva, N.K. and Yakuba, A.A.]

[Text] The specific features of a pipeline computing process for a microprogram computer are analyzed and the priciples on which a controller can be built are formulated, as well as the criteria in accordance with which pipeline performance can be estimated. An approach to simulation modeling is described which makes it possible to attain the optimum structure of a processor with a pipeline controller for a specified microinstruction system. Figures 3; references 4.

UDC 681.322

A COMPARISON OF PERFORMANCE LOSSES IN HOMOGENEOUS COMPUTER SYSTEMS USING A COMMON MEMORY AND AN EXCHANGE MEMORY

[Abstract of article by Shtrik, A.A.]

[Text] Multiprocessor and multicomputer complexes are compared using the criterion of a minimum of productivity losses which occur in the common data exchange process in the parallel running of programs. Formulas are given which make it possible to select an exchange system which provides for the least productivity losses for specified characteristics of the complexes and the programs realized in them. Figures 4; references 5.

UDC 681.335

ANALOG INTERPOLATORS WHICH REALIZE A NEWTONIAN POLYNOMIAL

[Abstract of article by Korobeynikov, V.N. and Kurgayev, A.F.]

[Text] The structures of analog to digital computing devices are analyzed, which restore the discrete functions prior to the continuous ones. This kind of device finds widescale use in computers and control devices, and is usually designed around simple restoration algorithms. Figures 6; references 8.

UDC 681.31

ON THE CALCULATION OF TEST SEQUENCE SOURCE CHARACTERISTICS IN A PROBABILISTIC EQUIPMENT DIAGNOSTIC SYSTEM

[Abstract of article by Romankevich, A.M. and Karachun, L.F.]

[Text] A method of designing controlled, pseudorandom sequence generators is treated, where these generators are oriented towards applications in a probabilistic system of technical diagnosis for digital equipment. A simplified method of calculating some of the probabilistic characteristics of the generator is proposed, where the technique is based on the use of the special features of stochastic circulant matrices for the corresponding Markov chains. Figures 1; references 7.

UDC 658.52.011.56

THE SYNTHESIS OF CONTROL ALGORITHMS FOR AUTOMATED SYSTEMS FOR TECHNOLOGICAL PROCESS AND PRODUCTION CONTROL BASED ON A MODULAR ORGANIZATION

[Abstract of article by Timofeyev, B.B., Artemyuk, B.T. and Ushakov, V.A.]

[Text] The specific features of the structural design of a multilevel ASUTP [automated system for technological process and production control] based on algorithmic modules are analyzed. The results of implementing such an approach are presented using the example of an ASUTP for the correction of the parameters of a wide strip hot rolling mill. The control system is realized using the dual processor M7000 ASVT-M [modular system of computer technology] computer complex. Tables 1; figures 2; references 6.

UDC 658.52.011.56

OPERATIONAL EDITING OF PROGRAMS IN THE AUTOMATED DESIGN OF SOFTWARE FOR AUTOMATED SYSTEMS FOR TECHNOLOGICAL PROCESS AND PRODUCTION CONTROL

[Abstract of article by Zaytsev, V.G. and Yegizar'yan, V.T.]

[Text] The PORT program for the operational editing of texts is described, which was developed as part of a package of applied programs for the automated generation of ASUTP software. The editing is accomplished frame by frame on the screen of a DM-2000 alphanumeric display. The functional capabilities of the program are given as well as the control operators for the editing and the diagnostic messages. PORT operates as part of the disk operating system of the automated software support system for the M7000/SM computer. It can also be used in diskless automated software support systems. Tables 1; references 3.

UDC 681.3.51./6.42

A COMPREHENSIVE SOFTWARE DEBUGGING SYSTEM FOR AUTOMATED PRODUCTION AND TECHNOLOGICAL PROCESS CONTROL SYSTEMS USING A DYNAMIC MODEL FOR THE CONTROLLED FACILITY (DINAMO)

[Abstract of article by Vel'bitskiy, I.V. and Sizov, A.A.]

[Text] Some expansion of the R-technology language is proposed which makes it possible to construct a comprehensive software debugging system for real time systems.

The characteristics of the "Splav-6M" modeling system are presented (for the M6000 computer), which is intended for checking the corresponding ASUTP and is constructed using R-technology. Figures 2; references 8.

UDC 681.327.22

THE STANDARD GRAS GRAPHICS PACKAGE. DESIGN. OUTPUT BASIS.

[Abstract of article by Manakov, V.V.]

[Text] The principles and criteria for the design of standard graphics software are treated as well as the levels of this software. The architecture and functional capabilities of the base output level of the GRAS standard graphics package are described. References 3.

UDC 681.31

AN AUTOMATED SYSTEM FOR THE DESIGN OF PORTABLE SOFTWARE FOR AN AUTOMATED CONTROL SYSTEM

[Abstract of article by Tashchuk, D.A.]

[Text] The composition and functioning of an automated software design system for automated control systems are described, as well as the basic principles of the procedure for manufacturing the program complexes. The utilization of the proposed procedure and system for the development of portable automated control system software is illustrated using the example of the Unified System for the Preparation of Control Programs for Production Process Equipment with Numerical Program Control. Figures 1; references 8.

UDC 681.31

ON THE DESIGN OF DIALOG TEACHING PROGRAMS

[Abstract of article by Novikov, S.V. and Shumlyayev, V.S.]

[Text] A software variant is described for an experimental teaching system with displays used as the terminals. The basic design principles of the applied dialog teaching programs are presented. An example of a dialog program is given. Figures 1; references 9.

UDC 681.31

A PROBLEM SOLVING PROCESS INTERPRETER FOR MINICOMPUTERS USING THE UNIFIED SYSTEM OF ELECTRONIC COMPUTERS

[Abstract of article by Maksimey, G.A.]

[Text] A method is developed for the practical construction of an interpreter for the M7000, SM-1 and SM-2 minicomputers using the Unified System of Electronic Computers, in which the functions of input-output organization for the disk operating system of the M7000, SM-1 and SM-2 are modeled. References 6.

UDC 681.31

DYNAMIC SEGMENTATION IN THE LYAPAS-M PROGRAMMING SYSTEM

[Abstract of article by Toropov, N.R.]

[Text] A method of dynamic segmentation of large programs is presented. Ways of realizing it are described for the LYaPAS-M programming system, and the advantages of dynamic segmentation over static segmentation are demonstrated. Figures 1; references 2.

UDC 62-181.4

A PROGRAM PREPARATION SYSTEM FOR THE K580IK80 MICROPROCESSOR

[Abstract of article by Artemov, Yu.I., Vyalov, V.L., Rudobaba, V.P. and Taran, Ye. A.]

[Text] A cross program tool complex is described which is based on the use of the small M-6000 control computer. The efficiency of the complex is assured through the use of a hardware--software interpreter. Figures 1.

UDC 681.31

ON AUTOMATING THE CODING OF HORIZONTAL MICROPROGRAMS

[Abstract of article by Dunayev, V.S.]

[Text] A microprogramming language for the 15VSM-5 electronic keyboard computer is described as well as a microprogramming automation system which translates the symbolic microprograms and provides for the output of the ROM wiring tables. The translation program is written in the high-level ALGOL-GDR language, which has the capability of working with both bit and text data. Figures 3; references 11.

UDC 681.31

A NONPROCEDURAL RELATIONAL DATA PROCESSING LANGUAGE FOR NONPROFESSIONAL COMPUTER USERS (DNEPR)

[Abstract of article by Vernik, L.V., Vinitskiy, I.M. and Shalashinskaya, Ye.N.]

[Text] A nonprocedural processing language is described which is based on relational calculus and oriented towards nonprofessional computer users. The language can be effectively utilized in a remote processing mode. The language capabilities are illustrated by means of typical queries to the data base. The realization of the language in the DNEPR AIPS [automated information retrieval system] is described, which was developed in the Scientifie Research Institute of Psychology of the UkrSSR. Figures 1; references 10.

UDC 65.011.56

BENCH TEST AUTOMATION BASED ON MICROCOMPUTERS

[Abstract of article by Tunik, A.A., Tsyvinskiy, V.G. and Mandrovskiy-Sokolov, B.Yu.]

[Text] Data on the automation of the tests of units and samples of new equipment are generalized. Treated as an example is the automation of vibration tests and service life tests of thermocouple converters. Figures 2; references 3.

UDC 681.322

A MONITOR SYSTEM AND PROGRAM SET OF SERVICE ROUTINES FOR AN EXPERIMENTER BASED ON THE 'ELEKTRONIKA-60' MICROPROCESSOR

[Abstract of article by Gromova, V.V., Rossoshinskiy, D.A. and Fadeyev, S.B.]

[Text] The operating system of an operator's (experimenter's) work position is described which is designed around the the "Elektronika-60" microprocessor. The structure of the operating system and its composition are analyzed: translators, service routines and the control program. Figures 2; references 4.

UDC 65.011.56

THE AUTOMATION OF STUDIES OF THE STRENGTH PROPERTIES OF STRUCTURAL MATERIALS AND ELEMENTS AT THE INSTITUTE OF PROBLEMS OF STRENGTH OF THE UKRAINIAN SSR ACADEMY OF SCIENCES

[Abstract of article by Grishko, V.G. and Troshchenko, V.T.]

[Text] A two-level system for the automation of studies of the strength of structural materials and components is treated, which is being developed at the Institute of Problems of Strength of the UkrSSR Academy of Sciences. The problems which can be solved at each level are analyzed and examples are given for local automation systems which are in operation at the institute. Figures 3; references 9.

UDC 658.52.011.56

THE AUTOMATION OF EXPERIMENTAL STUDIES OF MULTIPARTICLE NUCLEAR REACTIONS WITH DIGITAL IDENTIFICATION OF THE PRODUCTS

[Abstract of article by Berezin, F.N., Kisurin, V.A., Ofengenden, R.G. and Patlan', Yu.V.]

[Text] Questions of automating experimental studies of multiparticle nuclear reactions using an on-line minicomputer for the digital identification of reaction products and the separate storage of their energy spectra in real time are treated. The set of hardware and software which realizes the measurement procedure is described. Figures 4; tables 1; references 5.

UDC 65.011.56

A HYDROPHYSICAL INSTRUMENTATION AND COMPUTER COMPLEX

[Abstract of article by Nechesin, Ye.G., Nikitin, A.V., Paramonov, A.N., Timofeyev, Ye.I. and Shapovalov, Yu.I.]

[Text] The structure, functioning algorithm and software for a hydrophysical set of equipment for the study of small scale turbulence under local hydrological conditions are treated. The basis for the design of the equipment complex is a buswise organization and modular structure of the functional assemblies. Data is exchanged between the subscribers and the specialized minicomputer incorporated in the complex via direct memory access channels. Figures 2; references 7.

UDC 65.011.56

THE ORGANIZATION AND FUNCTIONAL ALGORITHMS FOR A DATA AND CONTROL SYSTEM FOR THE AUTOMATION OF FATIGUE TESTS

[Abstract of article by Alishov, N.I. and Karabetskiy, M.D.]

[Text] The primary data processing in an automated system for fatigue tests is described. The composition and structure of the hardware, as well as the functional algorithms for the system, are analyzed. Figures 4; references 4.

UDC 658.52.011.56

AUTOMATING CHROMATOGRAPHIC CALCULATIONS IN A PLANNED DIALOGUE MODE

[Abstract of article by Breydo, M.D. and Gromov, Yu.A.]

[Text] A dialogue system of program software for the operationally timely processing of experimental data is treated along with its application to the automation of chromatographic calculations. References 4.

UDC 681.3

A CRATE CONTROLLER FOR A SERIAL CAMAC SYSTEM

[Abstract of article by Damatov, Ya.M., Dechinpuntsag, Ch., Nikityuk, N.M., Nomokonova, A.I. and Semyenov, V.N.]

[Text] A crate controller for a serial CAMAC system is described, the importance of which is increasing at the present time because of the widescale introduction of microprocessors and microcomputers in automated systems. The structural configuration and a general view of the unit are shown. Figures 3; tables 3; references 9.

UDC 62-52:681.3.06

DESIGN PRINCIPLES FOR AUTOMATED CONTROL AND MONITOR SUBSYSTEMS FOR RESISTANCE WELDING IN INTEGRATED AUTOMATED CONTROL SYSTEMS

[Abstract of article by Ursat'yev, A.A. and Morozov, A.A.]

[Text] The functional distribution of tasks in a welding ASUTP [automated system for technological process and production control], the structure of the system and its position in a comprehensive automated control system are generalized. It is shown that the most acceptable design solution for a low level subsystem in the hierarchy of a resistance welding ASUTP is a specialized hybrid digital/ /analog computer complex with a nucleus in the form of a microcomputer from the second stage of the international system of small computers. Figures 2; references 27.

UDC 65.011.56

A HARDWARE AND SOFTWARE SET FOR THE CLASSIFICATION OF NOISE SIGNALS

[Abstract of article by Alkin, I.K., Geppener, V.V. and Timokhin, V.I.]

[Text] A noise signal classifier is described which is based on a series produced specialized computer, which is taught using a high performance computer. The structure of the batch of teaching programs is analyzed and the overall organization of the programs for the specialized computers is given. Figures 2; references 6.

UDC 658.52.011.56

ON ONE APPROACH TO THE OPTIMIZATION OF THE ANNUAL PRODUCTION PROGRAM OF A SHIPBUILDING ENTERPRISE WHEN DESIGNING AN AUTOMATED ENTERPRISE MANAGEMENT SYSTEM

[Abstract of article by Batura, A.I. and Fisun, N.T.]

[Text] A mathematical economics model is proposed for the task of the annual production planning and the product output of a shipbuilding enterprise, which takes into account the specific production features. The given model reduces to a problem of partially enumerable linear programming with Boolean variables, for the solution of which a heuristic algorithm is employed, which takes into account the special features of the limited model. The task program has been introduced at shipbuilding enterprises as a component of the standard project plan for unified system computer ASUP's [automated enterprise management systems]. References 9.

UDC 658.52.011.56

THE ALGORITHMIC STRUCTURE OF A WEAK NITRIC ACID PRODUCTION CONTROL SYSTEM

[Abstract of article by Kolesnik V.V. and Kurinnyy, A.I.]

[Text] An algorithmic structure is proposed for a standard system to control the production of weak nitric acid. The control tasks at the various levels are analyzed as well as their interrelationship. Block diagrams are drawn for the control subsystem of an individual unit as well as a group of units operating in parallel. Figures 2; references 7.

UDC 681.322

ON ONE METHOD OF GENERATING THE OUTPUT FORMS OF TECHNOLOGICAL DOCUMENTS

[Abstract of article by Gorbatina, G.N. and Shorodok, S.I.]

[Text] A set of programs which provide for the generation of documents with a complex structure is analyzed: routing and operational charts as well as other technological documents. It realizes the compression, expansion and editing of a text, the declension of words and the output of the document in accordance with the format. The described method of document generation makes it possible to obtain documentation complexes which differ in terms of their composition without changing the software. Figures 3; references 2.

UDC 681.3:658.56

PROGRAMMING AND SUPPORT SYSTEM FOR THOSE TEACHING AND TAKING COURSES. EXPERIENCE WITH USE AT THE HIGHER EDUCATIONAL INSTITUTE

[Abstract of article by Tarkayev, A.N. and Khas'minskaya, G.F.]

[Text] The initial results of the operation of the SPOK [programming and support system for those teaching and taking courses] system at Kazan University are discussed (the first stage of the base AOS [automated teaching system] of the USSR Ministry of Higher Educational Institutes: SPOK-VUZ), developed at the Institute of Cybernetics of the UkrSSR Academy of Sciences. The advantages of the system over a number of AOS's designed in the USSR and abroad are demonstrated. Problems are formulated which must be resolved for the successful application of the AOS in the higher educational institute. Figures 2; references 6.

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